

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

Published every Thursday Morning by DAVID WILLIAMS, No. 83 Reade Street, New York. Entered at the Post Office, New York, as Second-Class Matter.

Vol. XXX: No. 5.

New York, Thursday, August 3, 1882.

\$2.50 a Year, Including Postage.  
Single Copies, Ten Cents.

## Practical Application of Formulae.

Various communications have appeared in our columns, from time to time, on the subject of formulae and its practical usefulness in mechanical affairs. The disposition on the part of some writers has been to poke fun at professors and college-bred engineers who make use of formulae in their communications to the technical press. We have always believed that if practical men once comprehended the convenience of formulae they would come into more general use, and that applications would be made of them in directions that are at present undreamed of. The gradual introduction of formulae into daily conversation is something quite noticeable of late. For example, it is not uncommon to hear school children, in expressing their opinion of a certain proposition, to assert that something is "T. T." meaning, in the slang of the day, "too diaphanous." Again, when some one is quite indignant at the conduct of another, instead of going to profane extremes and calling him an idiot, coupled with an adjective having a sulphurous smell, it is quite customary in certain quarters to say he is a "D. F." Still another instance may

be cited. A convenient abbreviation in the shape of a formula, quite commonly employed by certain persons with whom we are acquainted, and used when there is necessity for great hurry, is "P. D. Q." Now, the exact meaning of this phrase, translated into the common language of the day, is "with exceptional celerity." The wonderful saving in breath and space accomplished by the use of this simple expression is clearly apparent. Another expression often employed with considerable earnestness in personal altercations is happily rendered by formula as follows: "D. L.," in which "L." stands for an aggravated condition of moral strabismus, and "D." an adjective intensifier of varying degree, according to circumstances.

Besides the utility of a formula for expressing personal qualities, it furnishes an effective means for expressing the value of those qualities in a practical way, as well as services and opinions. The manufacturer, for instance, can, by taking the average of a series of observations, determine the coefficient of efficiency of each employee, and tabulate them in the usual manner. Then by applying the graphic method, and upon a given base line erecting, at regular intervals, ordinates equal to the several coefficients found, he can determine the general curve of efficiency of the employees of the establishment. Having done this, if he wishes to find any of the several efficiencies of employee John Smith for example—say the efficiency of his labor—he looks on the diagram opposite the name of John Smith for the value of  $k$ , and then finds the efficiency required by the following equation:  $Vk = WT + E$ , in which  $W$  is wages per hour;  $T$ , time in hours;  $E$ , cost of outfit per day, including oil, cheek and waste;  $V$ , the market value of the labor when  $k$  equals 1; and  $k$  the personal coefficient of the said John Smith. It is at once apparent that if  $Vk$  is less than  $WT + E$  the services of said John Smith can be dispensed with at a profit. This method enables proprietors to readily determine the proper course for the management of their business. We have in mind an instance that recently occurred, which illustrates the importance of this method and its application. A young engineer having occasion to employ a force of laborers found, after a series of tests and observations, that in the case of John Jones  $V = \$5$ ,  $W = 30$  cents,  $T = 10$  E = \$2 and  $k = .5$ . In this case, the indication being unmistakable, there was effected a saving of over \$700 per year by the prompt discharge of the said Jones. The practical usefulness of formulae in determining this result in the case cited is so manifest as to need no comment.

## The Tacony Works of Henry Disston & Sons.

The Philadelphia Ledger says: The manufacturing industries of H. Disston & Sons, at Tacony, are assuming almost mammoth proportions. The buildings for manufactur-

ance of water for domestic and bathing purposes, free, the buildings belonging to others pay the usual rentage. The works are supplied with 2000 feet of hose, and water pipes are carried through all the manufacturing buildings for use in case of fire.

In connection with the business of H. Disston & Sons it may be mentioned that the firm say that the statement which appeared in a recent Montreal (Canadian) paper that they "are about to erect extensive works in that city," and that they "contemplate not only supplying the Canadian market, but supplying as well a large portion of their foreign trade from that point," has but little foundation in fact. They have in contemplation the establishment of a repair shop in that city for the purpose of repairing goods of their own manufacture. This repair shop, if erected, will be similar to those already in operation in the principal cities in the United States, and will not be used for manufacturing their goods. The plans for this enterprise are not yet matured.

According to returns of British furnaces in and out of blast up to July 1, it appears that

working railways, the consequent loss of time and several other items are, moreover, elements which, at present, prevent successful competition with foreign supplies. Improvements are, however, slowly and steadily progressing, as shown by official statements which, for the year 1881, record an output of 48,698,000 tons, this being an increase of 1,725,000 tons over the yield of 1880. In the year 1886 only 8,634,200 tons of coal were mined, the quantity increasing slowly year by year until 1870 the figures were 26,397,000. From that date the rise was more rapid, the annual increase being about 3,000,000 tons. In 25 years, therefore, the increase has been nearly sixfold, and the supply and consumption have been as follows:

	1866-70.	1871-75.	1876-80.
Production.....	124,214,500	173,425,000	204,570,000
Imports.....	8,000,000	10,400,000	10,014,000
Exports.....	5,000,000	20,380,000	26,370,000
Consumption.....	127,812,000	161,455,000	188,934,000
Av. p'd'n per ann..	24,842,400	34,485,000	40,914,000

Prizes in gold and silver medals are offered for appliances of sufficient merit. Gas engines are admissible for exhibition, but not to compete for prizes. No charge will be made for space and gas will be supplied gratis.

## Keller & Binzegger's Compressed Air Pump.

Among the many interesting exhibits at the last agricultural exposition in the Champs Elysées, Paris, was a pump worked by compressed air, and manufactured by Messrs. Keller & Binzegger. The pump consists essentially of two distinct parts. First, the compressor, which may be placed at any desired distance from the source of water, and second, the pump proper, or rather valve box, which is placed in the well or water reservoir. The engravings of this pump, which we present to our readers this week, and for which we are indebted to our contemporary, the *Revue Industrielle*, are well adapted to give a clear idea of the working of the apparatus, and will undoubtedly be found interesting. Communication between the com-

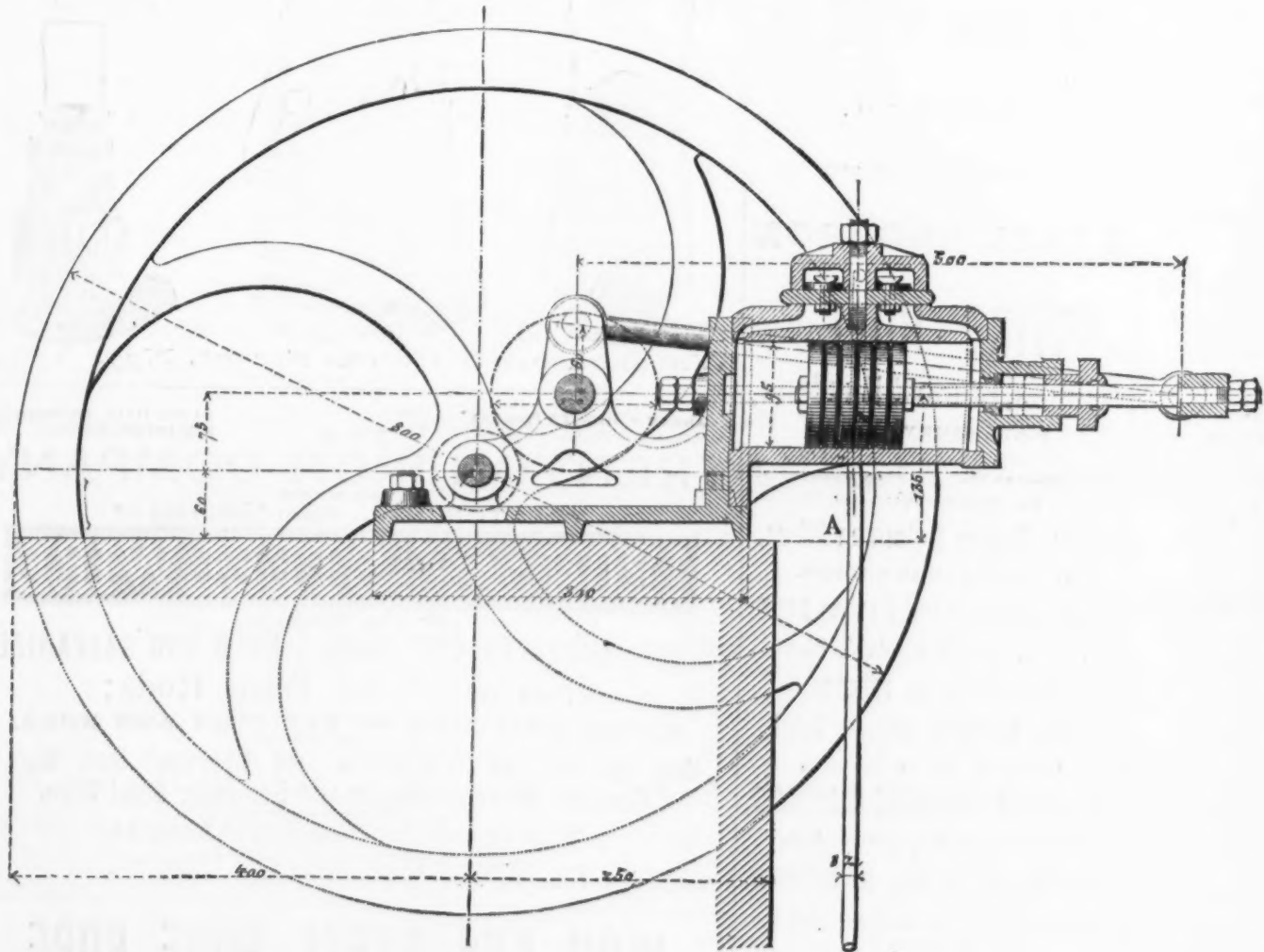


Fig. 1.—Elevation and Section of Air Compressor.

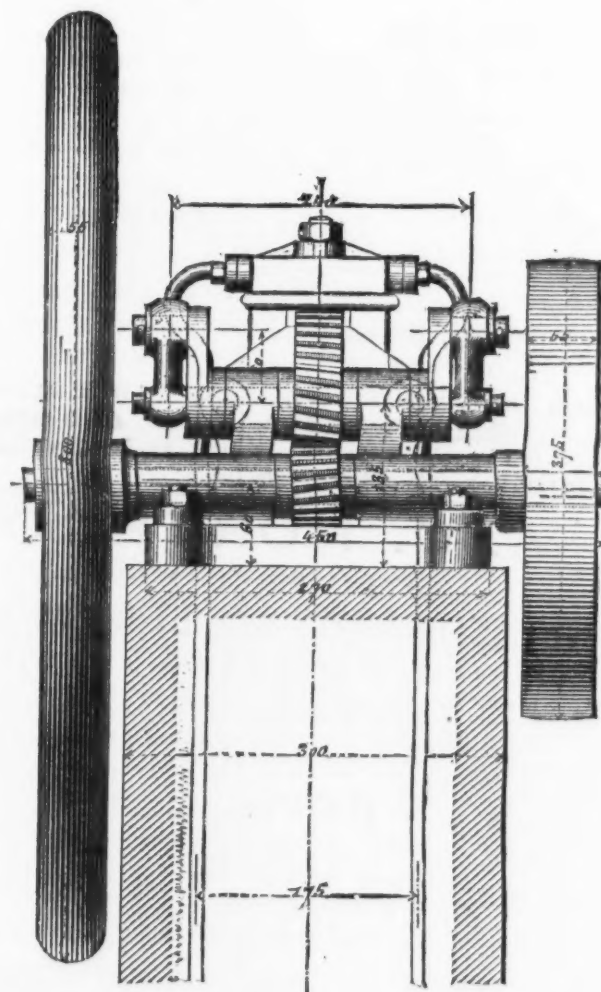


Fig. 2.—End View.

KELLER AND BINZEGGER'S COMPRESSED AIR PUMP.

ing purposes already erected cover six acres of ground, and the construction of others will follow in the early future, until, in the course of a few years, the entire works will be concentrated there. Notwithstanding this great increase in the manufacturing capacities of the firm at Tacony, it is stated that not a building or a foot of the ground of the works on Laurel street have yet been relinquished, the improvements at Tacony indicating the natural increase of the business of the firm. The total number of hands now in their employ is about 1500. The additions made to the Tacony works during the present year comprise an enlargement of the rolling mill by an extension 180 x 200 feet, making the mill 300 x 200 feet in size; a shop for the circular-saw department 55 x 285 feet, two stories high, with a wing 60 x 50 feet of the same height, and a shop for manufacturing saw-handles 80 x 40 feet. In addition to these, upward of 100 dwellings, 60 of them by the firm, have been erected in the village this year. Many of the houses are of a first-class character, having 6, 8, 10 and 12 rooms each, and being provided with all the modern conveniences of gas, water, bath, &c.

The file, handle and long-saw making departments are all now at Tacony. The capacity of the file department is so increased that 1000 dozen files can be turned out daily. An additional engine, 26 x 60, and of 2500 horse-power has been placed in the rolling mill. The works here have in use six engines, with a nominal power of 1000 horse combined. Steam pumps, capable of pumping 1500 gallons a minute, are in operation, drawing water from the river to supply the works and all the houses in the village with water. All the dwellings owned by the Messrs. Disston are supplied with an abund-

out of 922 furnaces built in Great Britain, 563 are in blast and 359 are idle. In Scotland the number of furnaces at work has been increased by three during the last six months.

## The German Coal Trade.

Reviewing the condition of the German coal market for the past few months, it appears that considerable fluctuations, both in prices and demand, were the prevailing features, and though at times the outlook was gloomy and discouraging, it may now be safely assumed that the market was in but few instances in a more flourishing and animated condition at this season of the year than at the present time. At the beginning of May sales were very heavy, prices being somewhat depressed, but since that time the tone of the market has become firmer, prices have gradually assumed higher figures, and a feeling of satisfaction and confidence in the future is discernible in all quarters. Notwithstanding these favorable conditions, the annual output of the German mines appears to be far behind the sanguine expectations which were entertained a few years ago. The opinion that Germany would, at no distant date, be entirely independent of foreign supplies was confidently expressed, and it was even thought that native supplies would become so abundant as to permit extensive shipments to foreign ports. Now, however, these wild projects have been abandoned, for, though German coal districts are perhaps not unfavorably located as regards exportation, the inadequate supply of means of transportation and the almost complete exhaustion of the products by the coke and iron establishments, present a formidable barrier to such a course. The primitive mode of

During the period from 1856 to 1881 the coal industries of Austria, France and Belgium have also been developed to a greater or less extent, and the advance in Great Britain during the same time has been at the rate of 150 per cent. Bearing the last-mentioned fact in view, it will be readily observed that European countries could not seriously think of competing with English coal, but as time passes and steady progress is made in these countries the subject is still worthy of note, and should be kept permanently and prominently in view by Great Britain.

It appears that the French Government is seriously contemplating the construction of a canal from Bordeaux to Toulouse, and the commission appointed to inquire into the scheme has quite recently submitted its report. The length of the proposed canal would be 270 miles, and its highest point would be 500 feet above the level of the sea. The necessary supply of water would be obtained from the Garonne and minor streams, and the canal would admit of the passage of war vessels, which would save the considerable distance around Gibraltar in passing between the Bay of Biscay and the Mediterranean Sea. The supporters of the project contend that its construction would, besides more obvious advantages, enable the vine to be cultivated along the water-way. The cost of construction is estimated to be considerable, and it appears questionable whether the advantages gained would be worth the expense.

The Association of Belgian Gas Works Managers has arranged for an international exhibition of gas-heating appliances, to be held at Brussels from August 1 to October 1.

pressor and the valve box is established by means of two pipes,  $b$  and  $c$ , of small diameter, the former serving as a feed pipe for the compressed air to the pump and the latter for its return to the compressor, after having performed its work. The compressor may be operated either by hand or by a separate engine, as may be required, and consists of a cylinder in which works a piston connected, by means of a piston rod and two side rods, with two cranks on a common shaft. The latter is provided with a gear wheel having inclined teeth, as shown in Fig. 2, the wheel being actuated by a pinion mounted on a separate shaft carrying a fly-wheel and driving pulley. The larger gear-wheel has 27 teeth and the smaller one 18. The fly-wheel is about 31½ inches in diameter, the driving pulley 14½ inches, and the cylinder of the compressor somewhat over 3½ inches. The cylinder overhangs the foundation, as shown in Fig. 1, and is provided with a valve chamber divided into four compartments, each two of which are in direct communication. Two of these compartments serve as exhaust chambers, and the remaining two as admission chambers for the compressed air, and the valves are arranged in a manner to meet these requirements. The pump proper, which is immersed in the liquid to be raised, consists of two cylinders,  $f$  and  $g$  (Fig. 3), placed in a vertical position and closed at the bottom by valves,  $p$ ,  $p$ , the orifices being, moreover, provided with gratings to prevent the entrance of solid substances, which might seriously interfere with the proper working of the several parts. At a certain height within these cylinders are two floats,  $a$  and  $i$ , which, in the absence of water, descend, open the orifices  $k$  of the pipes  $l$  and  $l$ , and thus establish communica-



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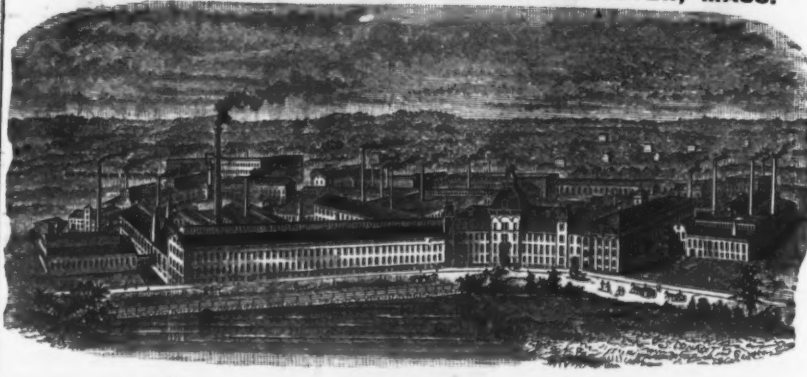
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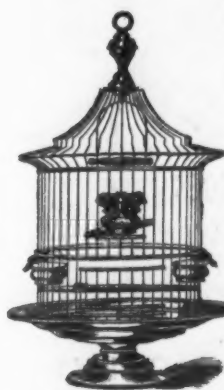
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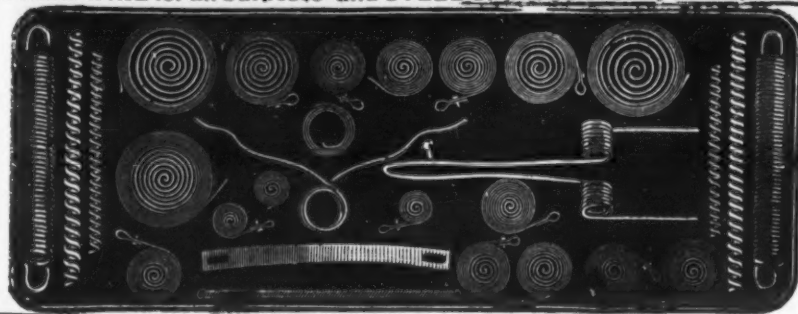
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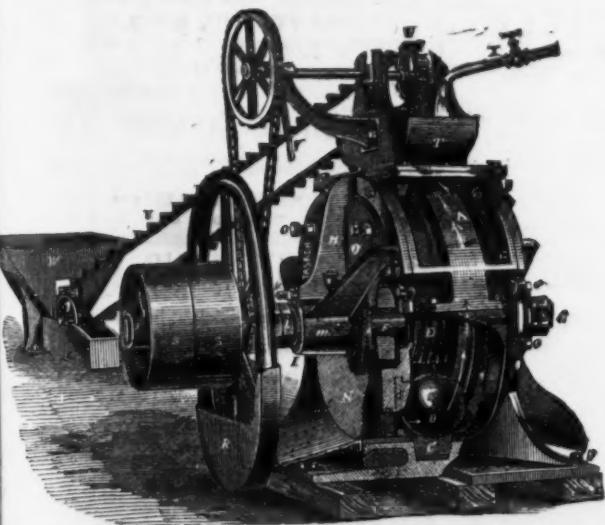
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tion between them and the cylinders *f* and *m*. Two conduits, *g* and *g'*, moreover open into these cylinders and are closed by ball valves (more clearly shown in Fig. 6, page 7) at the point where the delivery pipe *h* begins. The compressed air works alternately in the two chambers *f* and *m*, and Messrs. Keller & Binzegger, by an ingenious arrangement, have insured an automatic action. The tubes *l* and *l'* enter the chamber *c*, provided with four piston valves mounted on a common valve rod opening or closing the mouths

then enters the tube *l*, passes behind one of the four piston valves previously mentioned and forces them to the right. This new position of the valves puts the supply pipe *b* in communication with the pipe *c*, and the compressed air consequently enters the second cylinder *m*, acting in a manner similar in all respects to the one first described. The cylinder *f* at the same time communicates by means of the tube *e* with the channel *n*, which is connected with the exhaust pipe *o*, through which the air,

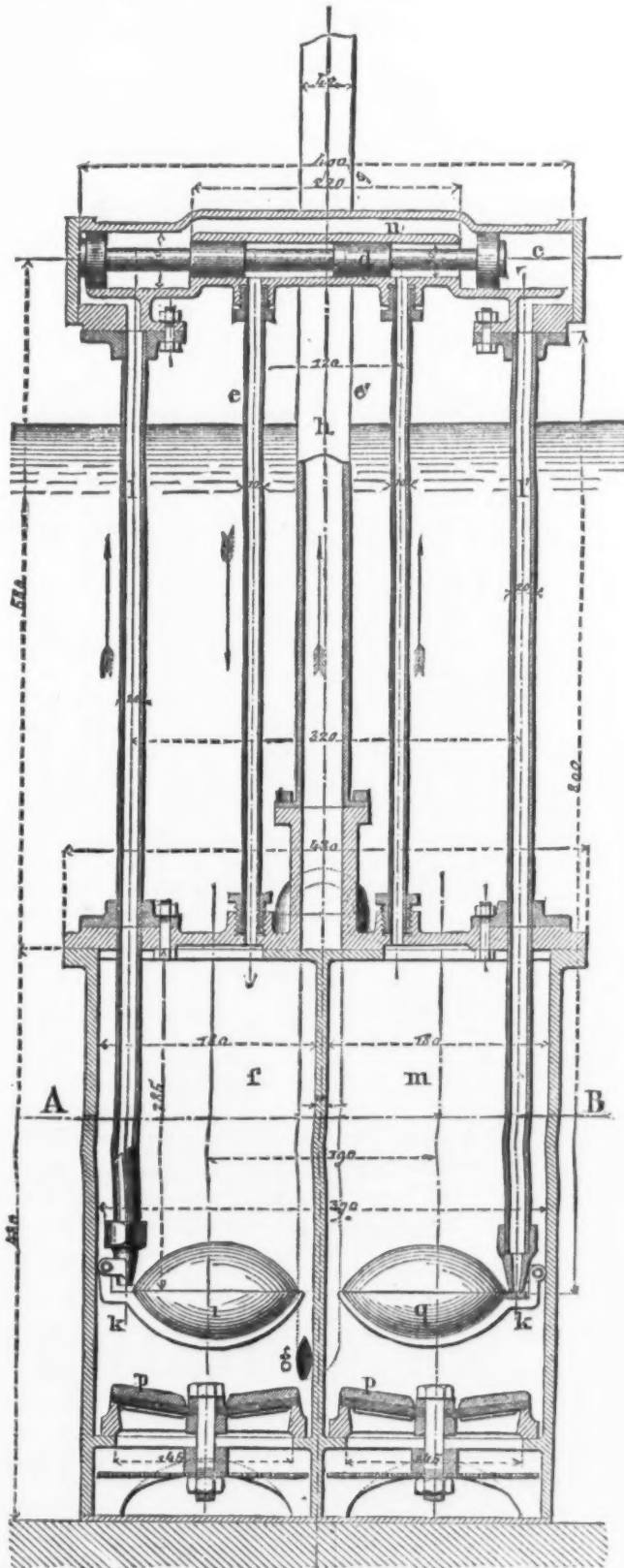


Fig. 3.—Vertical Section of Pump.

of the pipes *l*, *e*, *e'* and *l'*, as the case may be. Two tubes *b* and *o*, about 3-10th inch in diameter and of a length depending upon circumstances, establish communication between the chamber just mentioned and the valve chest of the compressor. The tube *b* serves as an admission pipe, and supplies compressed air to the space below the channel *n*, while the tube *o* serves as an exhaust channel and issues from the chamber *n*. A small ball valve, *r* (see Fig. 6, page 7), per-

after having performed its work, escapes. While the air is working in the cylinder *m*, water again enters through the valve *p* into the cylinder *f*, which will be filled as soon as the piston valves *d* have returned to their original position, and this action goes on automatically as long as the compressor is in operation. Twenty strokes of the piston of the latter are necessary to drive out all the water contained in one cylinder. With a speed of 75 revolutions

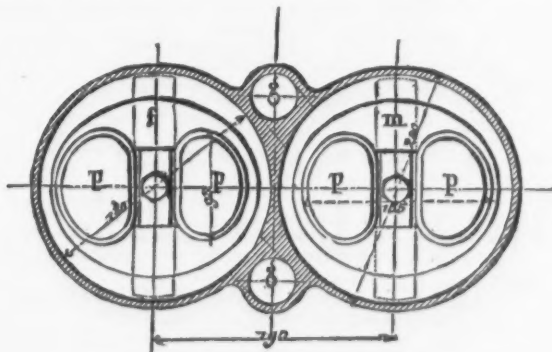


Fig. 4.—Section Along Line A B of Fig. 3.

mits the entrance of air into the compressor at suitable intervals.

Having thus given a brief description of the several parts of the apparatus, we will now describe its working as follows: Assuming the valves *d* (Fig. 3) to be in the position indicated in the engraving, it will be readily seen that the compressed air arriving through the tube *b* will, by means of the pipe *e*, enter the cylinder *f*, which we will suppose to be full of water. The pressure of the air will naturally force the water into the pipe *g*, and thence into the delivery pipe *h*, and as soon as the level of the liquid descends below the line of flotation of the valve *i*, the latter descends by its own weight and opens the orifice *k* of the pipe *l*. The air

per minute of the compressor, water may be raised to a height of about 65 feet, and owing to the ease of erecting the pump, and since it requires no attendance of any nature except starting and stopping, it appears to be well suited for a variety of purposes.

Our readers will, undoubtedly, have observed that the pump works somewhat on the principle of the Savery pump, compressed air, however, in this case taking the place of steam.

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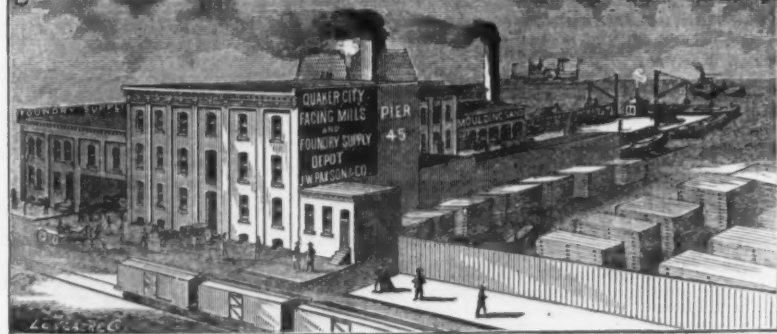


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and will enable them to obtain ample sup-  
plies of the cokes that will soon be sent  
from the Flat-top coal field. Mr. A. S. Mc-  
Creath, of Harrisburg, Pa., has, in the in-  
terest of the railways, recently visited this  
region and sampled its ores for analytical  
purposes, the following conveying a fair  
idea of the average quality of the deposits:

Bisulphide of iron.....	0.017
Protoxide of iron.....	none
Sesquioxide of iron.....	70.060
Sesquioxide manganese.....	4.338
Oxide cobalt and nickel.....	0.119
Oxide of zinc.....	0.050
Alumina.....	2.079
Baryta.....	0.230
Lime.....	0.679
Magnesia.....	0.375
Sulphuric acid.....	0.080
Phosphoric acid.....	0.409
Water.....	10.366
Silicious matter.....	10.779
Total.....	98.838

Metallic iron..... 49.059  
Metallic manganese..... 3.155  
Sulphur..... 0.041  
Phosphorus..... 0.179  
Phosphorus in 100 parts iron..... 0.365

## The Berlin Metropolitan Railway.

The latest addition to the great elevated  
railroads of the world is the Berlin Metro-  
politan Railway, which, begun in 1875, was  
opened for local traffic a few months since.  
The causes which gave rise to its adoption,  
the constructive features of the line, and a  
description of the permanent way, formed  
the subject of a paper recently read before  
the Civil and Mechanical Engineers' Society,  
England, by Mr. Wm. Bird. Without at-  
tempting to give all the particulars con-  
tained in Mr. Bird's paper, we will confine  
ourselves to the following interesting facts  
relating to the methods of construction of  
the line: The city of Berlin being situated  
but a few feet above the level of the River  
Spree, an underground railway was out of  
the question, as was also a railway on a level  
with the streets, and an overhead road was  
consequently resorted to. An embankment  
could not be adopted without serious incon-  
venience, and the characteristic feature of  
the line is, therefore, that of a viaduct. It  
consists mainly of brick arches and piers, the

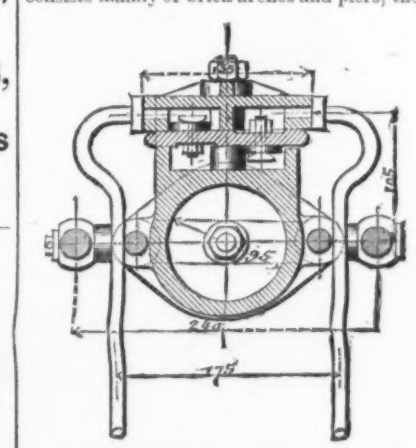


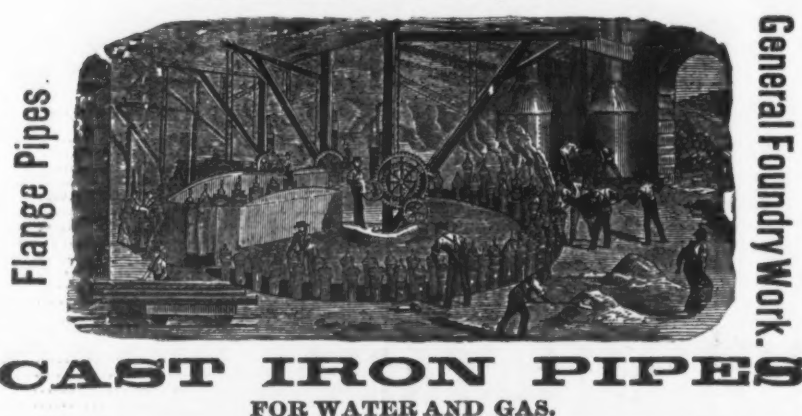
Fig. 5.—Section Through Cylinder and Valve  
Box of Compressor.

level of the rails being about 24 feet 6 inches  
above the level of the streets. The length  
of the spans varies from 26 feet 3 inches to  
49 feet 3 inches, and the arches are seg-  
mental, with a rise of 1/4 to 1-3/4 of the  
span, and with an average height of 19 feet  
8 inches from the level of the streets to the  
intrados. The width of the viaduct, meas-  
ured along the piers, is 47 feet 6 inches, but,  
by stone coping, this is increased to 51 feet  
at the top of the platform. The two center  
lines are 13 feet 5 inches apart from center to  
center, the outer ones 11 feet 6 inches from  
center to center, the gauge being 4 feet 8 1/2  
inches. The arches having been built with  
the view of being let out for various pur-  
poses, large openings have been made in  
most of the piers to facilitate communication  
between the same. The span of the arches  
varies with the depth of the foundations,  
and the deeper the latter the greater the span.  
The surface water is drained off by vertical  
shafts through the piers. The spandrels are  
built up with smaller arches, over which con-  
crete is spread, the whole being covered by a  
layer of asphalt and the ballast. In the  
center of the viaduct a small channel, 20  
inches wide, has been sunk for the protec-  
tion of platelayers and other inspecting of-  
ficials, and footpaths are arranged on both  
sides. The most interesting part of the vi-  
aduct is that in the Spree, being about 1980  
feet long, and consisting of brick arches of  
49 feet 3 inches span, 14 feet 1 inch rise, and  
piers built upon caissons. The foundations  
are either: (1) direct, (2) on concrete, (3) on  
concrete, between sheet piling; (4) on piles,  
(5) on stone wells or caissons. The two first  
require no further comment, but the follow-  
ing remarks may be of interest as illustrat-  
ing the Continental way of treating the three  
last-mentioned descriptions of foundations.  
In the case of piles, the same are on an aver-  
age 33 feet long, about 3 feet apart, con-  
nected transversely and longitudinally by  
strong sills, and the whole covered with a  
stout planking. The piles in each outer row  
are driven in at an inclination of 1 in 12. In  
the case of concrete between sheet piling,  
the latter is driven below the eventual depth  
of the foundation, the irregularities between  
the sheet piling being carefully calked; the  
material between the sheet piling is then  
dredged out and cement concrete sunk under  
water by means of large cylinders. This con-  
crete is left to harden, the remaining small  
quantity of water is pumped out, and the  
pier built up, thus avoiding the necessity of  
a coffer dam. In the case of brick wells or  
caissons, the walls of the well are built up,  
two bricks thick, on an oak frame, the whole  
being tightly secured by strong iron bolts.  
The wells have a square section of about 13  
feet, and are sunk by removing the earth  
from within. They are then filled up under  
water to a height of 6 feet with cement  
concrete, this being left to harden, after which  
the water is pumped out and the remaining  
17 feet filled in with brickwork. The cais-  
sons are connected at the top by small seg-



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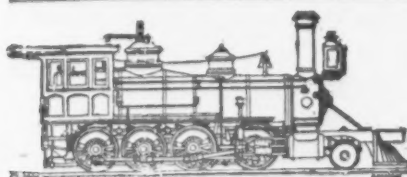
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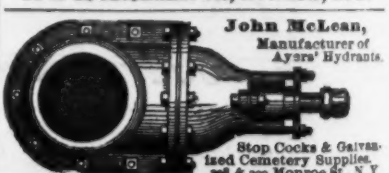
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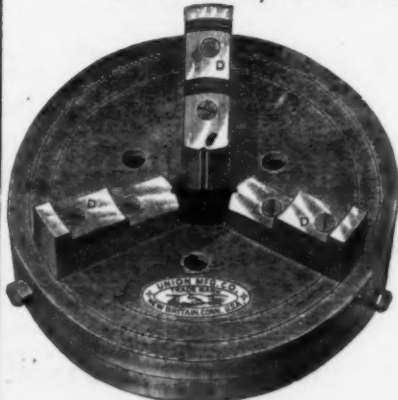
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mental arches, and the piers or abutments are placed on the top of the whole in the usual way.

There are only two stone bridges on the whole line, one having a span of 78 feet 8 inches over the Schiffahrts Canal in the Thiergarten. The other over the Spree, at the Museums Island, consists of two spans of 55 feet 8 inches, and 59 feet, separated by a pier 13 feet 2 inches thick, and crossing the

of the columns, thus presenting nearly the appearance of an arched bridge. The columns are provided with upper and lower ball hinges. The girders are anchored by means of strong bolts to the abutments, the object being to reduce all shocks to a minimum.

3. Lattice girder bridges. In all there are seven bridges of this type, five of which have horizontal upper and lower booms, and

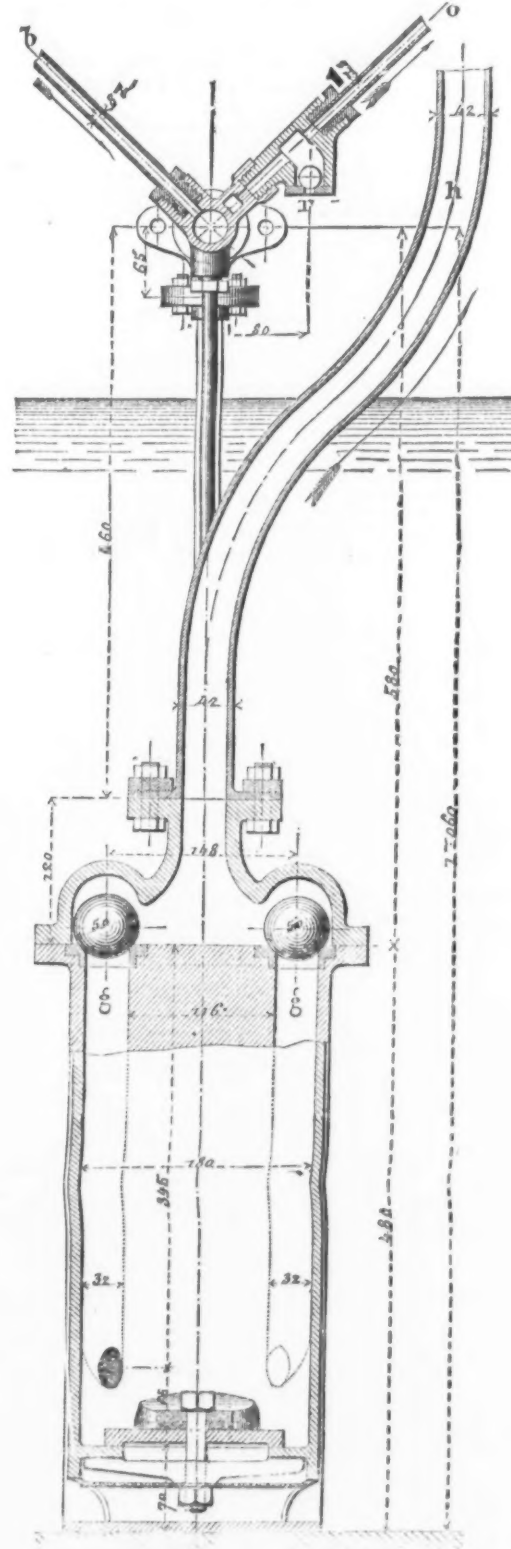


Fig. 6.—Vertical Cross Section.

river at an angle of 35 degrees. In consequence of this considerable skew, the bridge has been built in 11 ribs on the square, tied together at the crown by iron bolts. Wherever the viaduct is visible from the streets, great attention has been paid to its architectural development.

In all cases where streets are crossed iron bridges are employed. Of these there are 64 in all, with a total length of  $\frac{1}{2}$  miles of iron structure and spans varying from 55 feet to 164 feet. The Berlin police regula-

lattice-work consisting of tension diagonals and verticals. The bridge over the Spree at Bellevue, which crosses the river at an angle of 45°, consists of three spans of about 85 feet each, and two smaller side spans. In consequence of the oblique angle, the two mid-stream piers were not built as one continuous structure, but consist each of four cylindrical granite piers, about 4 feet 6 inches diameter, which carry the four principal girders forming the bridge. The cross girders rest on the top booms of the

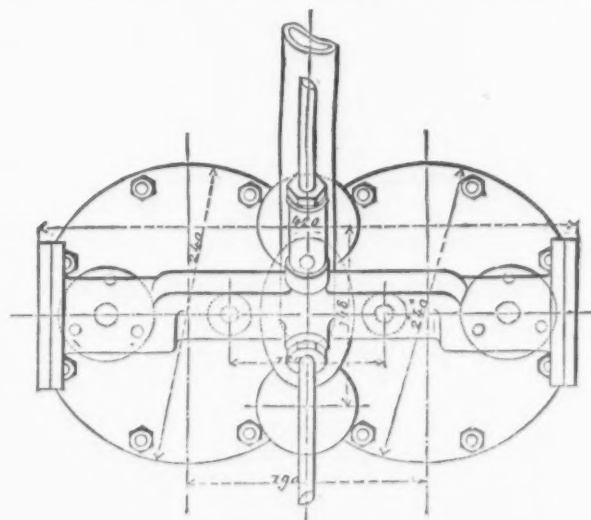


Fig. 7.—Top View of Pump.

tions require a clear height of 14 feet 5 1/4 inches from roadway to underside of bridge. These bridges may be classed as follows:

1. Ordinary plate-girder bridges, of which there are six.  
2. Continuous plate-girder bridges; 44 bridges of this type have been built, 42 of which are divided by two rows of cast or wrought iron columns into three spans, and two by one row of columns into two spans. The lower booms of these girders are bent down in elliptical curves on to the capitals

principals. The distance from center to center of each principal is 12 feet 1 inch. The lattice-work consists of isosceles triangles, the base of each being about 12 feet 1 inch, and the height 9 feet 1 inch. Over the piers the girders fit one within the other, but are not rigidly connected, thus giving the whole bridge the appearance of a light continuous girder. The left-sided bearing is fixed; the right-sided one consists of a pendulum bearing, so that the whole of the difference in length caused by change of tem-



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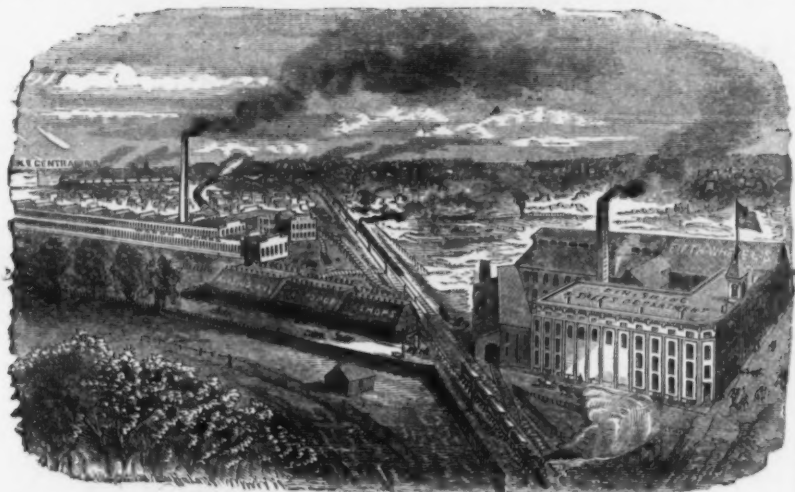
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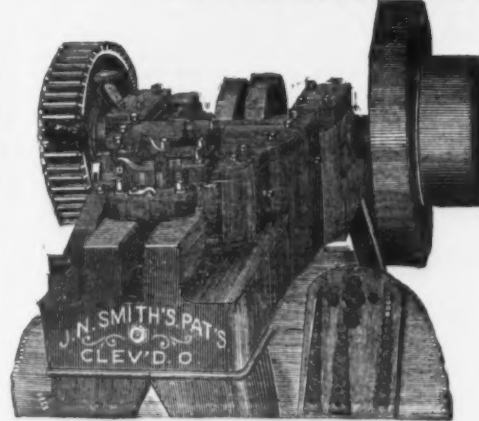
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Flat Wood,  
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Half-Round,  
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Handsaw Blunt,  
Handsaw (Double-End),  
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Handsaw Taper, slim,  
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Hook-Tooth,  
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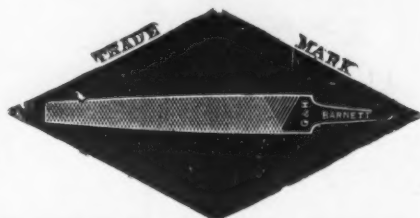
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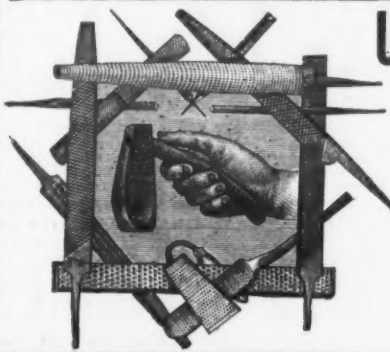
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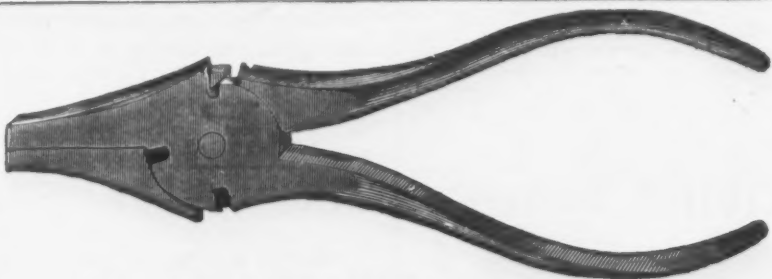
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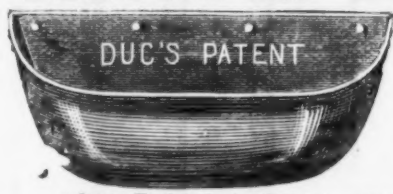
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HORSE NAILS.

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perature is compensated on this one side. The two mid-stream piers rest on stone caissons, while the land piers are built on piles and on concrete between sheet piling. The bridge over the Humboldt harbor, consisting of seven spans of 101 feet 8 inches, deserves mention on account of its peculiar construction. It consists of two trusses, the smaller of which hangs within the larger, the upper and lower booms of both trusses being riveted together and the smaller truss connected besides to the larger by diagonals. The girder is divided into four fields of about 24 feet 8 inches in width, and 12 feet 3 inches high, stiffened by vertical posts. The cross girders rest on top of the upper booms. The upper and lower booms are built up of 2 respectively 4 I irons strengthened by plates, the verticals consisting of 4 I irons. The bearings are constructed as ball hinges.

4. Trussed arch bridges. Seven bridges have been built on this type. The section of upper boom and arch is I shape to simplify the connection of the diagonals of the lattice-work, these having a  $\pi$  section. The plates joining the lattice-work to the upper boom and the arch have been kept as small as possible, so as not to interfere with the outline of the arch. At the crown of the arch the lattice-work is replaced by a plate. The lattice-work consists of double or single diagonals.

5. Elastic-arched bridges, or single diagonals, consisting of the arch and the upper horizontal girder connected by vertical posts. The section of the arch in this case is I-shape. Of this description only three bridges have been built.

The superstructure of all five descriptions of bridges is constructed on two systems. The one, consisting of small trough girders filled with gravel placed on top of the cross girders, was soon abandoned on account of the difficulties experienced where the lines had to be widened out, and in the approaches to the stations in the introduction of switches and crossings. In its place a platform constructed of buckle plates, over which from 10 to 12 inches of gravel is spread, was adopted. These buckle plates are supported by the cross and small longitudinal girders to which they are riveted; they are about 4 feet 9 inches square and 1/4 inch thick. This construction naturally increases the weight of the bridges to some extent, but the many advantages, such as simplifying the laying of the permanent way, deadening the noise, &c., decided on its adoption.

Although the road has been in operation only a short time, the many advantages resulting from the rapid and convenient means of communication have undoubtedly been already recognized. In the course of a comparison of this road with the New York roads, the *Railroad Gazette* stated that probably four times as many men are required for the ticket service in Berlin as in New York. This statement has been objected to by the *Journal of the German Railroad Union*, which says that with any ticket system it is necessary to have the tickets examined on entering and leaving the train and during the trips, and that this is all that is done on the Berlin roads. According to the *Railroad Gazette*, this is three times as much as is done on the New York roads, where the passenger buys a ticket at a window, and a few feet further on, at the entrance to the station platform, puts it in a glass box under the eyes of the gateman, and that is the end of the ticket inspection. If there were more than one class of tickets and cars, the work would be at least doubled, for it would then be necessary to see that those who entered first-class cars had first-class tickets; and if there were different rates for different distances, still more labor would be required, for it would be necessary to see that the passenger did not ride further than his ticket entitled him to, which might be done on the train, or by inspecting the tickets at the station where the passenger left the train. But the New York roads are only concerned to make sure that no passenger can get on a train without a ticket, and, as all tickets are alike, it is of little importance what car he enters or at what station he gets off.

## Railway Statistics for 1881.

The extraordinary progress which characterized railway construction in the year 1881, and which has already been dwelt upon to a considerable extent in the various journals devoted to railway matters, is again strikingly shown in the advance sheets of "Poor's Railroad Manual" for the year in question. The greatest mileage for any previous year was 7379 miles in 1871, and as this figure was exceeded by almost 2000 miles in 1881, it can be readily imagined that a correspondingly greater amount of capital and labor was employed in the prosecution of the work. The cost, at \$25,000 per mile, of the lines constructed during the year was \$233,750,000; and as, in addition, some \$75,000,000 were expended on lines in progress, and \$100,000,000 in old roads, in improving their tracks, in building new stations and in adding to their equipments, the total amount expended did not fall far short of \$400,000,000. Although it was anticipated by many that this unparalleled activity would exert a depressing influence on railroad operations in 1882, it should be stated that such doubts have been dispelled most effectually, and it appears to be an established fact that for many years to come a much greater extent of mileage will be constructed annually than was constructed during the past year. The enormous extent of the United States, being no less than 3,000,000 square miles, offers an attractive field for enterprise of this kind, and in almost every portion such works are rapidly progressing.

Aside from the more obvious advantages of increased railroad facilities, such as the speedy settlement and civilization of our Western States and Territories, the employment of both labor and capital is worthy of note, rolling mills, machine and repair shops, &c., being moreover patronized to a greater extent, and a beneficial influence exerted on the iron and steel industries of the country. The rapid increase of population is an additional favorable feature of the work which, as previously indicated, provides the means for the inland movement of large numbers, and outlets for the various agricultural, mineral and metallurgical

products. Poor says that the earnings all the roads in operation in the country during the past year were \$725,325,119, being an increase over the previous year of \$110,000,000, the rate of increase being very nearly 16 per cent. The current expenses were \$449,565,071. The amount of interest paid during the year on the funded debts was \$128,887,002 and the amount paid in dividends was \$93,344,200, against \$77,115,411 for 1880. The greater part of the vast sum expended in the construction of the roads was paid in wages, the number of persons employed in operating them averaging fully 12 to the mile of operated line, or about 1,200,000 in all. The number employed in the construction was 400,000, thus increasing the total number to 1,600,000, or about one thirty-second part of our population, the latter being estimated at 53,200,000.

Present indications would appear to point to an enormous fall traffic on all roads, with a consequent appreciation of values in their securities and awakened interest in their extension and in all manufactures depending on them. The tonnage of the various roads has also increased to a remarkable extent within the past 30 years, convincing proof of this statement being furnished by the fact that in 1851 the value of the tonnage, at \$50 per ton, did not exceed \$250,000,000, against a value of \$12,000,000,000 in 1881. It may be interesting in this connection to submit the following statement by Poor, showing the number of miles of railroad constructed and in operation each year in the United States, from 1830 to the close of 1881 inclusive:

Year.	Miles in operation.	Annual increase of mileage.	Year.	Miles in operation.	Annual increase of mileage.	Year.	Miles in operation.	Annual increase of mileage.
1830.	21	...	1848.	5,090	398	1866.	36,801	1,742
1831.	95	74	1849.	7,305	1,301	1867.	39,250	2,449
1832.	220	124	1850.	9,021	1,605	1868.	42,229	2,979
1833.	380	159	1851.	10,822	1,801	1869.	45,844	3,615
1834.	613	233	1852.	12,908	1,986	1870.	52,014	6,170
1835.	1,090	465	1853.	15,500	2,452	1871.	60,283	8,273
1836.	1,773	683	1854.	18,720	3,220	1872.	66,171	5,888
1837.	2,497	724	1855.	22,374	3,654	1873.	70,238	4,067
1838.	3,121	624	1856.	26,010	3,636	1874.	72,381	2,173
1839.	3,702	581	1857.	29,591	3,581	1875.	74,090	1,499
1840.	4,218	516	1858.	32,968	3,377	1876.	76,807	2,817
1841.	4,773	555	1859.	36,720	3,752	1877.	79,089	2,288
1842.	5,270	497	1860.	40,713	3,993	1878.	81,776	2,687
1843.	5,718	448	1861.	44,981	4,268	1879.	84,407	2,626
1844.	6,177	459	1862.	49,500	4,519	1880.	87,071	2,571
1845.	6,633	456	1863.	54,270	4,770	1881.	89,813	2,542
1846.	7,030	397	1864.	59,288	5,018			
1847.	7,598	568	1865.	64,585	5,297			

The table is interesting in many respects, and shows conclusively that, at the present rate of increase, our annual mileage will, at no distant time, be something astonishing.

## TRADE PUBLICATIONS.

## REPORT OF NINTH CINCINNATI INDUSTRIAL EXPOSITION.

The report of the Board of Commissioners of the Ninth Cincinnati Industrial Exposition has come to hand, giving a detailed account of the exercises of the opening day, the rules governing the Exposition, and the reports and awards of the jurors. The report embraces somewhat over 300 pages, and is divided into nine departments, designated by letters from "A" to "I." The first department is specially devoted to an exhaustive treatment of the stationary, portable and traction engines, railway rolling stock and appurtenances, represented at the exhibition, and contains a large amount of highly interesting matter. Department "B" embraces minerals, metals, railroad supplies, hardware, stoves and heating apparatus, the space devoted to it being occupied chiefly by lists of the articles exhibited and the premiums awarded. The third department is similar in all respects to the one just mentioned, tobacco, liquors, provisions, &c., however, being the subjects considered. Departments "D" and "E" give particulars of household furniture, ornaments, textiles, clothing, &c., but present nothing strikingly different, either in appearance or general arrangement, from "B" and "C." Department "F" contains unclassified matter of all kinds, while the remaining departments are devoted to science and education, horticulture and the fine arts. A table at the end of the report shows the daily receipts and the attendance from Sept. 7 to Oct. 8, 1881. According to this statement the exhibition was most liberally patronized on Oct. 7, the number of persons which passed through the turnstiles being 15,793, and the receipts amounting to \$2806.75. The number which attended during the whole of the exhibition was 234,216, and the receipts during the four weeks were \$35,755.

The tenth exposition will open on Sept. 6 and continue until Oct. 7. Attention is, in this connection, invited to the national character of these exhibitions, which have been held in Cincinnati since 1870. The exhibitions have, on account of their dignified character and value to the commercial interests of our country, commanded the attention and confidence of exhibitors and visitors from nearly every State and Territory of the Union. The success which has attended them is, probably, owing in a great measure to their plan of management. The direct control is submitted to a Board of Fifteen Commissioners, five of whom are appointed by the Chamber of Commerce, Board of Trade and Ohio Mechanics' Institute, respectively. Arrangements for reduced rates of fare have been made with the railroads radiating from Cincinnati, and persons desiring to visit the exposition will be furnished, on application by mail to the secretary, with full information of rates of fare, &c. Liberal preparations have been made for the exhibition of machinery in operation, and for the display of manufactures, works of art and products, and articles for the exposition may be sent from all parts of the country at low rates.

## SAW MILL MACHINERY.

Mr. D. J. Murray, of Wausau, Wisconsin, has sent us an illustrated catalogue of saw mill machinery, manufactured at the Wausau Iron Works, including prices of general mill furnishings of which he carries a large stock. New buildings have recently been erected and improved machinery added, thus



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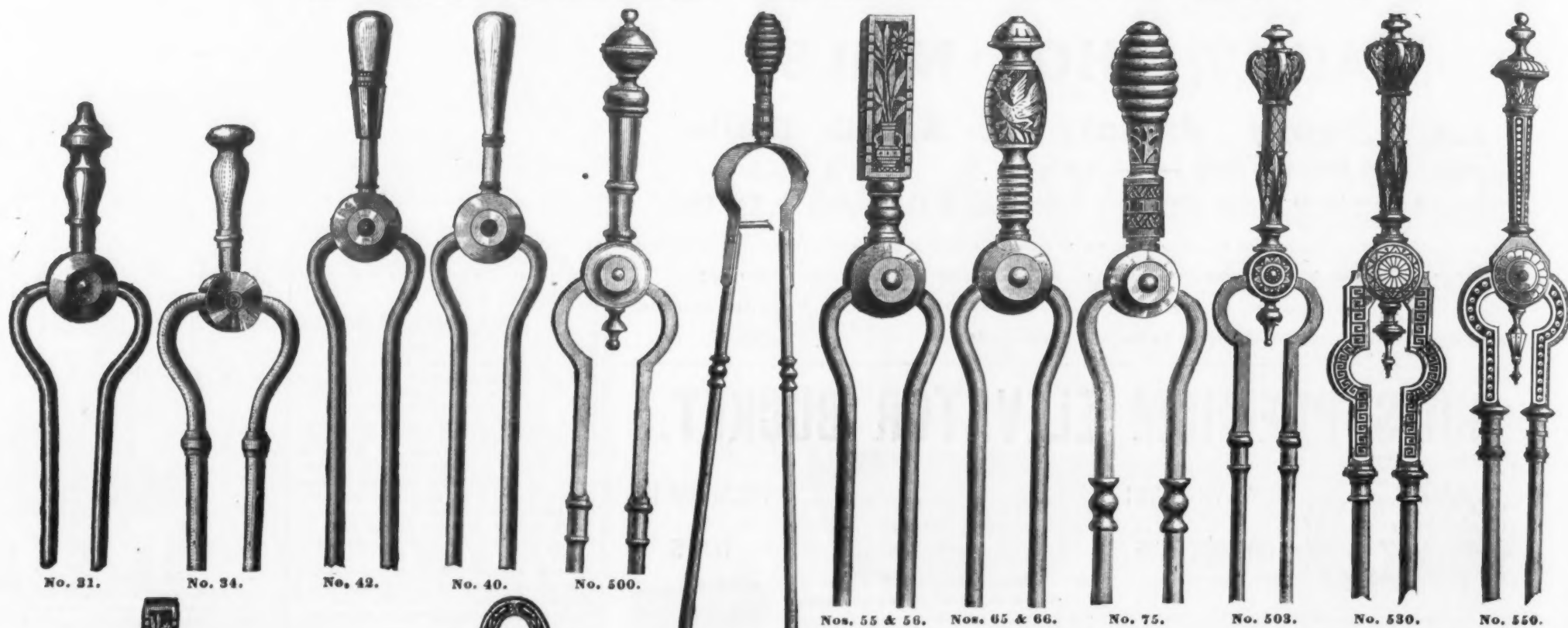
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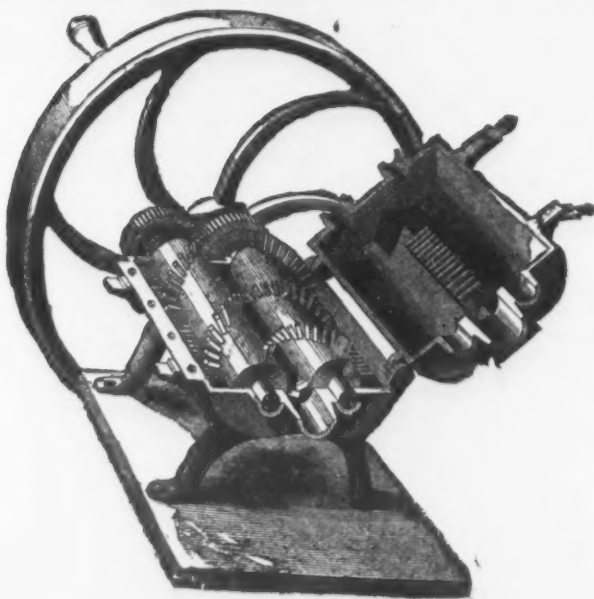
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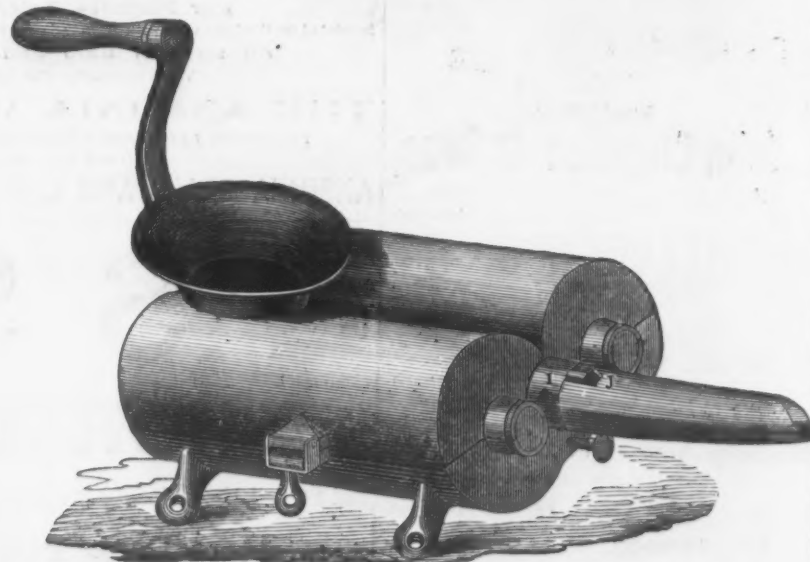
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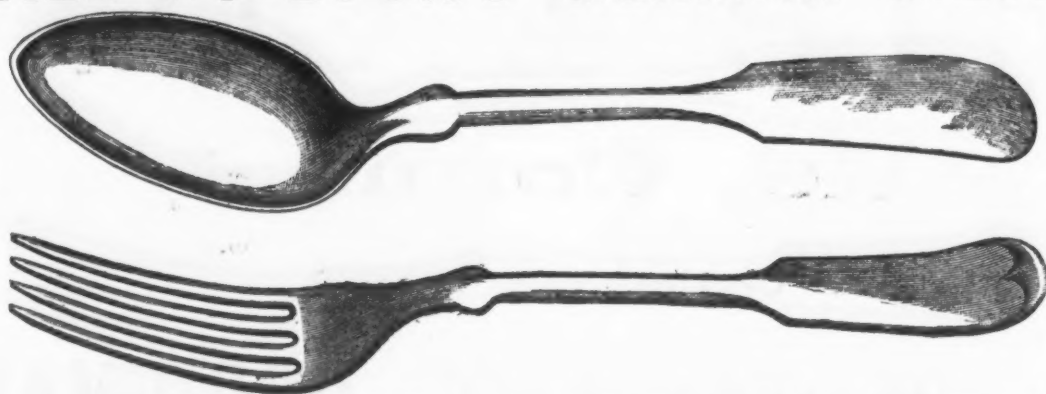


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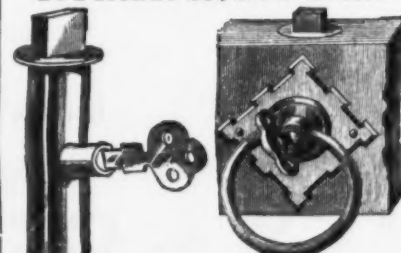
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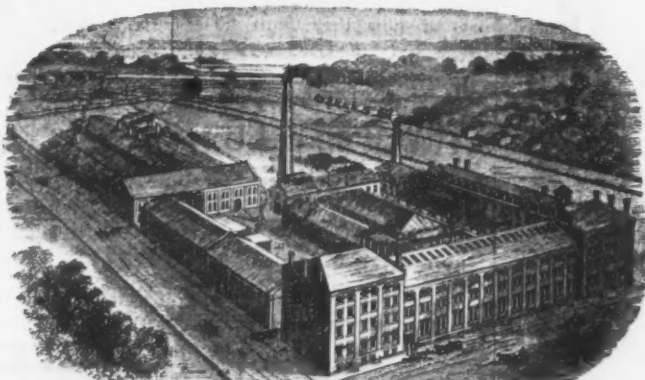
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### Reese's Patents and The Bessemer Association.

The differences between the Bessemer Steel Association and Jacob Reese, over the ownership of certain inventions and letters patent for manufacturing iron and steel, which is of long standing, came to a head last Friday by the Bessemer Association, through their attorneys, Messrs. Hampton & Dalzell, filing a bill in equity against Mr. Reese and the Harrison Wire Company, of St. Louis, and securing an injunction against Mr. Reese, restraining him from selling or transferring any of the numerous patents, &c., in dispute. The bill, which is very voluminous, sets forth that the plaintiff is a partnership association, organized June 22, 1874; that one of the provisions of the organization is to protect certain letters patent, the purchase of such other patents as the members of the association shall deem essential for carrying on business, grant licenses to use the patents by parties other than members of the organization, and the regulation of the terms upon which the members engaged in the manufacture of steel by the Bessemer or pneumatic process may use the patents in their several establishments.

#### PURCHASE OF REESE'S PATENTS.

In the summer of 1879 the plaintiffs entered into negotiations with the defendant for the purchase of certain inventions, letters patent and applications for letters patent relating to the manufacture of iron and steel. On September 25, 1879, these negotiations resulted in an agreement between the parties, to which a supplemental agreement was added on November 5, 1879. This agreement carried with it not only the transfer to the Bessemer Company of the patents, letters patent, &c., therein described, but also conferred upon the company the right to own all such inventions and processes in the metallurgy of iron and steel, or devices for the manufacture of pig iron or steel ingot, blooms, billets and plates as the defendant should thereafter invent and apply to have patented, together with all letters patent which should issue for all such inventions, in consideration of which Mr. Reese was to receive \$5000 and .05 on every ton of iron or steel, unless the number of tons manufactured would place the royalty in excess of \$10,000 a year, which was fixed as the limit. Soon after making the agreement the plaintiff company paid the defendant \$5000, and on October 22, 1879, the five letters patent described were assigned to the company.

#### LIST OF NEW PATENTS.

Subsequently the defendant filed application for letters patent on the following inventions, and notified the company of the fact, at the same time requesting them to state whether they desired them: An improvement in protecting carbon by the use of manganese in the Bessemer process; improvement in regenerative metallurgical furnaces; improvement in protecting carbon by the use of lime; improvement in the process and apparatus for cleaning and utilizing waste gases of blast furnaces; improvement in blast furnace plants; improvement in the method of making lime brick; improvement in the basic process for the dephosphorization of iron; improvement in producing a metal high in phosphorus and carbon and low in silicon; improvement in dephosphorizing at the blast furnace for the same heat of metal; improvement in producing fibrous wrought iron from the converter; improvement in applying the conditions of the puddling furnace to the basic converter; improvement in indicating, preparing and solidifying materials for furnaces, and an improvement in the production of ferro-phosphorus. The plaintiffs notified Mr. Reese that they would take these inventions and furnished the money to meet all expenses, thus becoming the equitable owners thereof.

#### HOW THE DIFFERENCE OCCURRED.

Mr. Reese soon afterward notified the plaintiffs that several of the letters patent did not clearly specify nor wholly secure several of the inventions, and requested to be allowed to apply for a reissue. The plaintiffs consented, but afterward was informed by their counsel that to secure the patents it was best to apply for original papers instead of reissues. This was under consideration when the difference between the plaintiffs and Mr. Reese occurred. On September 20, 1881, Mr. Reese and Mr. Andrew Carnegie signed an agreement under which Mr. Reese assigned all his right to collect royalties and all other rights allowed under the agreement of September 25, 1879, in consideration of an annuity of \$5000, and on condition that Mr. Carnegie would secure all letters patent with which there was any interference at the Patent Office, and also secure extensions of those the limit of which had been reached. This agreement Mr. Carnegie transferred to the Bessemer Steel Company, of which transfer Mr. Reese was fully advised. Upon the date of the signing of this latter agreement Mr. Reese was paid \$2500, being the first semi-annual payment of the \$5000 annuity. About the 1st of January the plaintiffs were made aware of the fact that Mr. Reese claimed that there were certain letters patent connected with

#### THE BASIC PROCESS

which were secured prior to the agreement of September 25, 1879, and were not specified in that agreement. The plaintiffs claim that their agreement with Mr. Reese was intended to embody all the inventions of the defendant made before or after the agreement. A list of Mr. Reese's inventions was furnished to the plaintiff, wherein were in-

cluded those belonging to the plaintiff and the others claimed by Mr. Reese as still his own property. Among the latter were several that had been tendered to the plaintiff and accepted. The object of Mr. Reese, they allege, was to defeat the orator in securing the benefits of the inventions described, and covered by the applications for reissues of letters on the certain inventions, and for which applications for original letters were filed at a later date. All these inventions were the property of the plaintiffs by virtue of the agreement of September 25, 1879, and with Mr. Carnegie. Mr. Reese, besides applying for reissues of letters patent, applied for letters patent for inventions embraced in letters already secured, of which supplemental letters he made no tender, but of the existence of which the plaintiff learned through the list already mentioned. In May, 1882, the plaintiffs notified the defendant that they would take all letters patent not already assigned and pay all expenses. They also offered, at various times, \$2500 which was due Mr. Reese, being the second installment of his annuity, which he refused or neglected to take.

#### TRANSFERRING A PATENT.

About this time Mr. Reese executed to the Harrison Wire Company, of St. Louis, Mo., an agreement licensing them to use various patents for the making of heavy steel castings, producing different grades of steel from the same heat, and for producing steel high in carbon and low in silicon, in Jackson County, Ill. These patents had been tendered and accepted by the plaintiff, and were purchased by the Harrison Wire Company with a full knowledge of the existing agreement between Mr. Reese and the plaintiff. The defendant corporation could not legally utilize the rights secured under this agreement, yet it was a cloud on the completeness of the plaintiff's rights. On July 15, 1882, Mr. Reese demanded the \$2500 due under Mr. Carnegie's agreement, but was told that it would not be paid until he assigned all the aforesaid letters patent to the plaintiff. In consequence, on July 25 Mr. Reese notified the plaintiff that he would rescind the existing agreements. This, the plaintiffs claim, he has no right to do. They claim that no royalties are as yet due Mr. Reese, but they are willing to pay all that is due under the second agreement. The plaintiffs have been notified that Mr. Reese is about to, or may attempt to, sell the patent rights, which, though impossible for him to do, would involve the plaintiffs in expensive litigation. They ask the Court to grant a preliminary injunction until the hearing, thereafter to be made perpetual, restraining the defendant from selling the letters patent. They ask, also, that the Court declare their rights under the agreement of September 25, 1879, and direct the assignment of all patents by Reese to them. Also that the agreement between the Harrison Wire Company be declared void. Judge Stowe granted the preliminary injunction, but fixed no time for a hearing.

### The Iron Ore District of Bilbao in Spain.

The Biscayan hematite deposits which have been known for centuries, and the development of which has, within recent years, attained such astonishing proportions, formed the subject of an interesting paper read at the spring meeting of the British Iron and Steel Institute by Mr. William Gill. Notwithstanding the fact that the vast subject was condensed to a considerable extent, it is impossible for us to give all the particulars dwelt upon, and we hope that the following extract, referring to the mines of the Bilbao district, will be found acceptable. Commencing above the town of Bilbao, on the left bank of the river Nervion, and taking them in order from S. E. to N. W., these deposits may be separated into seven groups, viz:

Ollargun Brown ores, each mixed with clay.  
Iturigorri Brown ores.  
Castrejana Brown ores in large deposits.  
Matamoros Brown ores (not worked at present).  
El Regato Brown and red and brown ores (these are the Triano and Somorostro main deposits).  
Somorostro Brown ores.  
Galdames Brown ore.

From official returns, the output of these mines in 1881 is ascertained to have been 2,800,075 metric tons; Matamoros, Triano, and Somorostro having contributed 2,599,204 tons, or about 93 per cent. of the whole. The iron ores found in these deposits are known locally as:

Campanil (Red hematite).  
Rubio (Brown hematite).  
Vena dulce (A soft, rich ore, common to both deposits).  
Carbonato de hierro (Spathic ore).

The Campanil, under workable conditions, has hitherto been found only in Triano and Somorostro, and forms but a small proportion of the whole. As it is the mineral most sought after at present, it is disappearing far more rapidly than the brown ore, which has only recently been exported on a large scale. It offers the greatest facility for extraction of any ore in the district. It is slightly inferior in metallic iron to the brown ores, but its freedom from siliceous matter renders its selection easy. The vena dulce is soft, of a deep purple color, and very rich in metallic iron. It is the ore that has been worked for centuries past in Biscay, by galleries and underground excavations. The remains of these show how extensive the workings must have been. The vena dulce is seldom wrought separately now, unless it be in small quantities for special purposes, or for treatment in Catalan forges, or by the Chenot process. It is usually mixed and shipped with the other ores with which it may be in contact. The Rubio is a hard brown ore, and when of good quality, is richer in metallic iron than the campanil. From its associations with siliceous matter, and, occasionally, with pyrites, it requires careful selection. It also contains more moisture than the other ores. The Rubio deposits are at times very deceptive, and what appear on the face of them to be mountains of ore, turned out to be merely shells of good mineral, with nothing but poor siliceous stuff behind them. The spathic ore occurs in both red and brown ore mines. The most extensive deposits of it yet found are in the latter, where it underlies the Rubio. The relation of these ores to each other and their order of formation, have not yet been thoroughly investigated, and neither geological surveys of the districts nor deep borings have been



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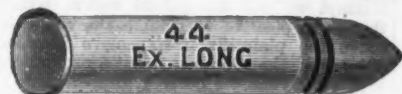
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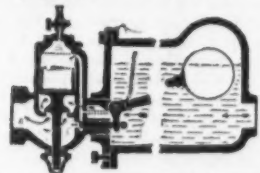
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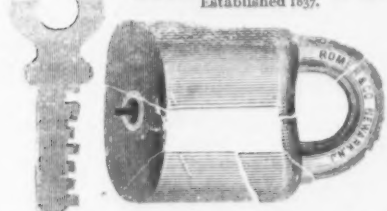
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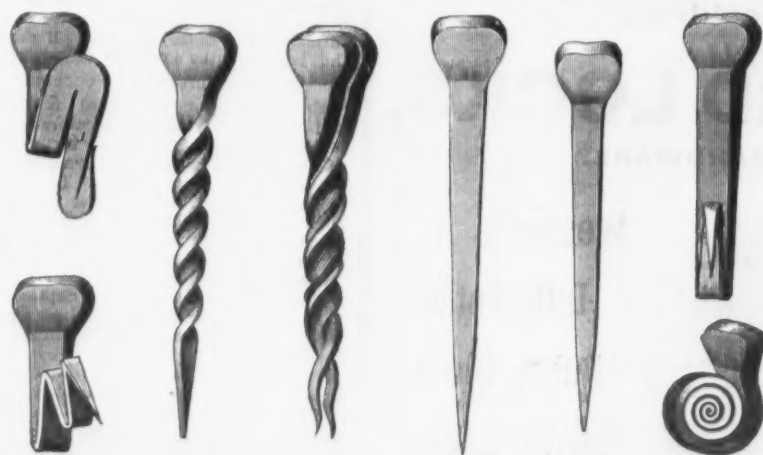
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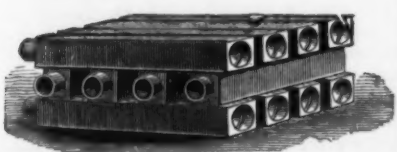
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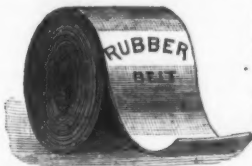
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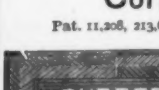
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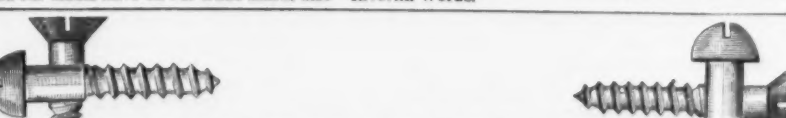


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made anywhere. The quantity of mineral contained in the Metamorphos, Triano, and Somorostro deposits was estimated by the Government engineers at about 160,000,000 tons some years since, and a project for the verification of this estimate by means of borings is said to now be under consideration. In some Campanil mines an intermediate bed of compact limestone exists, the ore below it being softer, and partaking more of the nature of vena, than that above. This intermediate limestone is not continuous, and where it does not occur, the ore descends in an unbroken mass from the shales above to the limestone below. In brown ore mines, the vena, where it occurs, is generally found overlying the rubio, and with only a slight covering of clay, or vegetable earth. The rubio in this case deteriorates in quality as it descends, until at last it is so mixed up with spathic ore and siliceous matter that the cost of selection is considerably increased. There seems to be no absolute rule as to the relative positions of the rubio and vena; for, in some mines, the latter will underlie the former, the ore growing purer as it descends. Both orders of position are observable in the Matamoros district. Certain of the rugged escarpments of rubia, that form such remarkable features of the brown ore mines, have probably been at one time covered with vena, which, being the softer ore, has been washed out. The two ores are often, but not invariably, separated by beds of clay. The following analyses give the average quality of the ore raised in the mines of the Orconera Company.

	Red Ore	Brown Ore
	Campanil	Orconera
Ferrous oxide.....FeO	78.03	79.96
Alumina.....Al <sub>2</sub> O <sub>3</sub>	0.21	1.44
Manganese oxide.....MnO	0.86	0.70
Lime.....CaO	3.61	1.00
Magnesia.....MgO	1.65	0.55
Silica.....SiO <sub>2</sub>	5.91	8.10
Sulphuric acid.....SO <sub>3</sub>	0.01	0.15
Sulphur.....S	trace	0.05
Phosphoric acid.....P <sub>2</sub> O <sub>5</sub>	0.03	0.03
Carbonic acid.....CO <sub>2</sub>	5.00	—
Combined water.....H <sub>2</sub> O	4.60	8.25
	99.91	100.18
	54.62	55.97
	54.80	56.10

Metallurgical iron.....FE

The mines of the Bilbao district are staked out in rectangular allotments, the basis of superficial measurement being a rectangle of 100 meters square, termed a "pertenencia," of which four at least are necessary to constitute a mine. Between the allotments irregular free spaces of less than four pertenencias frequently occur, termed "demasias," the right to the ownership of which is a source of much dispute. The right of mining is granted in perpetuity, a certain surface tax to the State being, however, required. The concession to raise mineral gives no right to the surface of the ground, but empowers the miner to appropriate it if necessary. With the development of the mines, this question of surface rights has recently become one of importance, affecting unfavorably the cost of raising the ore. It is complicated by the pretensions of the numerous squatters who have built tenements all over the district, owning no title, paying no rent, and yet blocking the way to the working of many mines. The older mines, having been granted prior to legal enactments as to area, are divided into small lots, and the majority of them are in the hands of several proprietors, which is to be regretted, being fatal to good working, leading to waste mineral, and being a source of constant dispute. The overlapping of mine boundaries constitutes another source of inconvenience, and is partly due to the system adopted by the Government of ranging the boundaries by the magnetic compass instead of by reference to a fixed meridian.

The general practice in the different districts is to let the quarries to small contractors, and their lack of reliability and experience in mining operations is a source of constant annoyance. The quarrying is simple, as, with the exception of an occasional shaft or heading, there is no underground work. All that is wanted is care in selecting the ore—a matter of trouble in wet weather. Machine drills are unknown, and the boring tool used is the ordinary jumper, worked by two to six men, according to the depth of the hole required. The maximum depth of hole is about 35 feet (Spanish). Large blasts are not practiced, 2500 tons being the largest on record. The holes, after being bored, are enlarged at the base by the ignition of a small charge of dynamite, and the blasting charges (powder for soft ore, and dynamite for limestone and harder material), are introduced and fired in the usual way. Very little judgement is exercised in placing the shots. The prevailing idea seems to be to drill a hole anywhere and put a big charge into it; hence a waste of labor and explosives, with pulverization of the mineral, and its dispersion all over the quarry. The ore blasted down is broken up by hammers and wedges, selected, and is either hauled by railway direct from the quarry to the port, or passed by subsidiary haulage systems to one of the various railway depots, where it is put to stock to await shipment. Among other systems of transportation we would mention inclined planes, of which there are eight in operation, being self-acting with but one exception.

The Orconera Iron Ore Company's Railway is about 7 1/2 miles long, and enters the Campanil district some 650 feet above sea level. The rolling stock consists of eight main line and two shuttling engines, two small locomotives for Orconera mine, 418 bottom-door mineral wagons, to carry 7 tons each, 80 4-ton incline wagons, and 22 ballast wagons. Two additional main-line engines of a more powerful type are now being built, the present engines being capable of hauling 20 wagons up the line. The river terminus is at Luchana, where are also the offices, repairing shops, and laboratory. The shipping appliances comprise four staiths, normal to the river, spaced 318 feet apart, and approached by embankments laid with self-acting gradients. The moorings consist of five buoys in mid-channel, and eight dolphins between the staiths, besides the usual land bollards. The total river frontage is 1650 feet. Owing to the soft ground, it was desirable to carry the staith approaches across the swampy foreshore with as little height as possible; and a still further inducement to this was the difficulty of raising the level of

the Luchana station yard beyond a certain point. Under these circumstances loading by a simple inclined shoot was impossible, and a method of shipment had to be devised requiring far less than the usual height from high water to rail level. The arrangement now at work was designed to meet this difficulty. It consists essentially of a swing platform projecting from a timber tower, to which it is hinged at its inner end, on trunnions, being raised and lowered (like a draw-bridge) by chains, passing from the outer end and over drums on the top of the tower and counterweighted. To admit a light vessel under the tip, the platform is raised to a convenient angle, and, when the ship is berthed, it is lowered, and the wagons are run on to it, discharging their contents vertically into the hold through an open-mouthed hopper. To avoid injury to the tank tops of an empty ship, from the unbroken fall of mineral, this hopper has suspended from it a telescopic arrangement of tubes, which are raised or lowered at will. The lower tube is provided with doors, so that, when required, the contents of a wagon are received and retained in the trunk. Upon commencing to load, the tubes are run up, and the doors closed; the charge of mineral is received in the trunk, which is then lowered by a hand-brake, the tubes sliding over each other, until the lower one reaches nearly to the bottom of the vessel, when the doors are opened by releasing a catch, and the mineral allowed to drop from a harmless height. The tubes are then run up from another charge, by means of counterweights sufficient to lift them when empty, their ascent being controlled by the brake. The contents of four or five wagons are thus put into the ship, after which the mineral is discharged through the trunk, with the doors left open. The trunk doors are closed by a small winch; in other respects gravitation, governed by a brake, does the work. In whatever position the platform may be, the trunk hangs vertically from it. The best day's work at one staith was to load three separate steamers with 2730 tons of ore in 12 1/2 hours, including the time for berthing, making fast, and casting off.

The river of Bilbao possesses at present two defects which unfavorably affect the trade of the port, one being a sand bar at the entrance to the harbor, and the other, a want of space within the river for the convenient mooring and swinging of the ships. The bar permits the passage of vessels drawing 15 feet to 15 feet 6 inches, during about four days of spring tides, but if bad weather prevails, the port is practically closed to the exit of loaded ships, as soundings cannot be taken by the chief pilot, and without them no passage is permitted. At high water neap tides there is generally 11 to 12 feet depth on the bar, but at this draft steamers cannot carry a paying cargo, they prefer to load deeper and await the following springs. If they are then neaped the detention becomes serious, and, moreover, the fairway of the river becomes blocked up with loaded ships to such an extent that, when at last a favorable sailing tide offers, confusion and accidents ensue. Extensive works are, however, now in progress for the improvement of the port, comprising a dock for loaded vessels; a river-cut to straighten the channel; about four miles of pitched quay walling; the dredging of about 3,200,000 cubic meters over a length of about eight miles of river bed, and the erection of an iron screw pile training jetty across the bar. It is expected that the completion of these works will permit the minimum depth of the channel to be maintained at 20 feet. The pilot service requires better regulation, and in view of the irregularity in the state of the bar, ships should be allowed to leave at night, when conditions are favorable, this being now forbidden.

In 1881, 3239 vessels, laden with 2,500,532 tons of ore, sailed from the river for foreign ports, and the largest single cargo was 1690 tons. According to present indications there is every reason to believe that this output will be maintained, the export of mineral for the first quarter of 1882 already exceeding that of the corresponding period in the previous year by 53,000 tons. The quantity of red ore exported at the present time exceeds that of other kinds, and is out of all proportion to the available supply. The present rate of output will cause a rapid exhaustion of the deposits, which, in 10 years, will undoubtedly be reduced to comparative insignificance, unless fresh deposits be discovered under workable conditions. The brown ore must, therefore, be considered as the main source of future supply, and it is fortunate that the quantity is sufficient to last for a long time to come. Nevertheless, the waste of ore in the district is lamentable, and the adoption of suitable measures to prevent it might yield highly profitable results. A return to the exceptionally high prices of ore in 1880 is hardly to be expected or desired, but it is hoped that the lowest figure will not be touched again for any length of time, as many mines will not be able, in that case, to work at a profit. A reduction in freights is anticipated, on the completion of the port improvements, which will both enable the purchaser to buy as cheaply as heretofore, and the miners of Bilbao to work profitably and compete with other districts.

**Exhibition of Hornwork.**—The Horners' Company of London purpose to hold an exhibition of articles, ancient and modern, British or foreign, made of horn, or of which that material is a component, exclusive of ivory, bone, or tortoiseshell, at the Mansion House, on October 18, 19 and 20 next. Prizes will be given to members of the trade. Further information may be obtained of Mr. C. H. Compton, 19 Great George street, Westminster.

Mr. W. Matthieu Williams, in a letter to the *English Mechanic* recently, expresses the opinion that a large proportion of the electric lighting companies now in process of formation in England have no excuse for existence, and that their chief object is stock-jobbing. While he has the greatest faith in electric lighting, he thinks it is necessary to warn his friends in regard to this reckless formation of electric lighting companies. As we have had occasion to notice previously, the mania in England is even greater than in this country, and the nominal capital runs well up into the millions.



# The Iron Age

AND

## Metallurgical Review.

New York, Thursday, August 3, 1882.

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### Differential Rates of Freight.

A truce in the ruinous "railroad war" was tacitly proclaimed when the several antagonizing companies consented to a reference of the questions in dispute to an "Advisory Commission." Mr. Wm. H. Vanderbilt, of the New York Central, who seemed to have been most resolute in a determination to prosecute the war, or at least to remain in a passive and independent position, is understood to have invited the reference, if, indeed, he did not originate the idea. The gentlemen selected to consider the subject of differential rates, the vital point at issue, were Allan G. Thurman, ex-Senator United States from Ohio; Elihu B. Washburne, late Minister to Paris, and Thomas M. Cooley, Chief Justice of Michigan, whose report, after protracted investigation at the principal seaboard cities, has at last been presented. In explaining what is meant by the term "differential rates," as applied to the several termini of the trunk lines, they remark:

An idea of the extent of the differences is indicated by the statement that, taking the charges for the transportation of eastward bound freight from Chicago to New York as the standard, those to Boston are made the same, and those to Philadelphia a cents, and to Baltimore 3 cents per 100 pounds less. On westward bound freights the differences are not uniform, but are made higher in the case of those classes of property which are rated highest in the freight tariffs. As between the seaboard cities and St. Louis, Cincinnati, Toledo and other Western towns, the rates are proportioned to the Chicago rate according to mileage. This is the existing rule or practice.

Contrary to what had been charged, they find "abundant evidence that New York is 'fully maintaining its present lead, and that its trade is enjoying a growth so healthy and vigorous that its commercial classes can well afford to regard without envy or regret the prosperity of other places, and may well concede to them, without repining, all the advantages which have come to them as a result of competitive efforts." In proof of this, the commission present the following table, showing the relative proportion of the total receipts of grain and flour at the four Atlantic ports which was received at each:

	1878.	1879.	1880.	1881.	1882.
New York.....	56.0	52.6	53.5	56.5	60.0
Boston.....	10.0	10.6	11.7	14.3	16.8
Philadelphia.....	16.7	15.3	15.6	11.7	11.6
Baltimore.....	17.3	21.5	19.8	17.5	8.7

Total..... 100.0 100.0 100.0 100.0 100.0

The conclusion is that the existing differentials are not unjust, and, therefore, should not be disturbed; but they contend that they are liable to operate unfairly, and if, at any time, "it shall appear that they tend to deprive any one of the seaports affected by them of the proportion of business that would naturally come to it under the operation of normal competition, the want of equity in the rates will appear, and it will be right to modify, or perhaps abolish them." In a word, the report leaves the question precisely as at the first. Nothing is definitely determined, so that the "war" may be renewed at any time, by any one of the railroad corporations that becomes dissatisfied. For this and other reasons, the report is spoken of among merchants on 'Change as a disappointment. At present they admit there is little discrimination against New York, the old differences not having been restored, and it was hoped that, in settling the future policy of the pooled roads, the decision of the commission would serve as a guide. In their calculations, the distance and cost of transportation on competing routes seem to have had little weight as controlling factors, nor the advantages of any particular port, whether natural or acquired through the enterprise of its citizens. In other words, as stated by a prominent railroad manager, the conclusions about the equity of differential rates are so vague in terms that they have little authority. It is intimated, however, by representative railroad men well qualified to speak, that the hostilities of last year are not likely to be renewed.

### Pittsburgh's Water Works.

What with the strike at Pittsburgh, and the constant danger of a water famine—arising from the repeated breakages of the huge water works engines, that city has no dearth of sensations. Of the progress of the strike we have kept our readers quite well informed; of the progress of the breakages, though they furnish more constant items than the strike, we have long ago abandoned all efforts to keep track.

On last Friday the *Pittsburgh Dispatch*, in an article on the engines, had the following résumé of the situation at the water works:

Engine No. 1 has a cracked valve chamber, with a large piece blown out near the top. It has, however, been braced with three 4-inch and a number of 2-inch bolts, and clamped together like a medieval cannon bound up with hoops. The engineers think they can start it to-day or to-morrow with one plunger, but doubt that it can do much work, because the wooden bulkhead can't stand the pressure of 160 pounds to the square inch.

Engine No. 2, which is connected with No. 1, is likewise weak in the valve chamber—nothing more decided, however, than a few serious cracks that have been frequently noted. A bulkhead in its valve chamber separates the compartments of the two plungers, and it is ready for work with one plunger, and will start as soon as No. 1 is ready.

Engine No. 3 worked weakly off and on up to 5 o'clock in the afternoon, when she broke the wooden bulkhead in her valve chamber—just as Nos. 1 and 2 may be expected to do when started—and stopped until 8.30 for repairs. Starting again, she broke a dr. in valve on the cylinder and stopped again. In the absence of telegraphic or telephonic communication, it was impossible late last night to find out whether it was running or not.

Engine No. 4.—Work would be finished this week but for a delay caused by the Atlas Works failing to fit the castings together before they were sent from the shop. As it is it will not be ready for work in less than two weeks. Everybody knows that this engine has not turned a wheel for two years for want of repairs.

Having four engines put in at an expense of thousands of dollars, in its strait Pittsburgh has been obliged to call upon the mills of the city, many of which have pumps of considerable capacity, to aid them in furnishing water for domestic consumption, and a number of their works are pumping into the mains. It is a curious fact in this connection that the old Eleventh street engines, which were condemned five years' ago, are still pumping water into the Bedford avenue basin, while all of the engines built on the plan that was to revolutionize engine building are broken down. It is perfect folly to charge that all of this is due to weak castings. With the very large factor of safety demanded in the building of such engines, even if the iron was as weak as claimed and the principles and proportions of the engine right, there would be no such constant breakages as appear at present. The only method of relief and the shortest is to immediately abandon these engines, and make preparation for their removal and for the placing of engines built on well-tested plans.

### Gradings for Tin Plates.

We call attention to an article in another column of this issue on "Tin Plates and Brands," from the *Ironmonger* of London. It possesses especial interest for us, as it shows that the leading iron and metal trades journal of Great Britain has adopted our view of the solution of the tin-plate question, and joined us in urging consumers to buy according to quality and with reference to intended use, and not by name or on the assurance of dealers. The *Ironmonger* agrees with us in believing that "the consumer has the remedy in his own hands," and that if he applies this remedy "the system of brands would thus be superseded to a great extent, and the present anomalous condition of affairs thoroughly swept away."

It is time that all sentimentalism on the subject of tin plates was abandoned, and that dealers and consumers should have a clear understanding. Speaking generally, brands are untrustworthy as indications of quality; and they always will be, for the reason that it is scarcely possible to maintain a standard of quality which shall be uniform. We have known lots of inferior plates to be foisted on the market under brands which are everywhere considered safe guarantees of quality. Why is it that opinions as to the quality of certain brands differ so widely? The answer is, that sometimes they are one thing and sometimes another. They may average high or low; but the fact that the consumer who buys by brand does not always get what he expects, shows that he cannot trust the name simply. The countless abuses which have sprung up in the tin-plate trade can, we think, be corrected only by a system of accurate and honest gradings by reputable dealers. These gradings will be effected, not by a classification by brands, but by actual assorting according to quality, and the grading of a given lot of plates will depend simply upon what they are. The dealer may designate these classifications by such names, letters or numbers as he may choose. It will make no difference to the consumer whether one or several makes are sent to fill his order. If the quality he receives is what he has ordered and intends to pay for, it will make no difference to him whether it includes two or twenty brands, and whether these are makers' or private. As we have already said in these columns, we believe this idea would be popular with consumers, and that a house which has the confidence of its customers could not do better than to adopt it.

### A Mexican Mercantile Navy.

Full details have come to hand respecting a grand scheme which is about being carried into execution by several wealthy Mexicans, under contracts from the Government, for the establishment of several lines of ocean steamers, first to the United States, and afterward to Italy. Two companies have been formed for this purpose, both under the same management, and almost the entire stock, amounting to \$4,000,000, has been taken by Bermajido Bros., old Spanish merchants and cotton manufacturers; Portillo's Sons, who own some of the largest woolen factories in Mexico, and the Arena Bros., likewise largely engaged in manufacturing. Another gentleman interested is Ignacio Pomba, Senator from the State of Oaxaca. They have made a deposit as a guarantee for the fulfillment of the terms of the contract. According to the stipulation, the Mexican Continental Navigation Company, as the new corporation is to be called, is to establish two services, one with steamers of 2000 tons burden from Vera Cruz to Progreso, Havana and New York, and the other, with steamboats of at least 500 tons burden, from Vera Cruz and Minatitlan, Frontera de Tabasco, Leguna de Terminos, Campeachy and Progreso. The trips of the New York line are to be weekly, and the coastwise steamers are to be run in connection with them. The second contract is for the establishment of two other steamship lines—one from Vera Cruz to New Orleans, and the other to the Gulf ports of Tuxpam, Tam-

pico, Bagdad and Galveston. These Continental lines are to be in operation before November 1, 1883. A new steamer of 1500 tons burden is to be placed on the New Orleans line, and one of 500 on the Galveston line. The Government is to pay the company a subsidy of \$1800 for each round trip. It is supposed, further, that the rates charged shall be from 10 to 15 per cent. less than those charged by Alexandre & Son's line, whose contract expires in September, 1882. The New York lines are to receive from the Government \$2000 for each round trip; the others, \$1800. It would thus appear that the United States are not only being left behind, but are actually in danger of being crowded out, where our shipowners have already established themselves in the business of ocean transportation. The British Australian Colonies, the Dominion Government, and now China and Mexico, all find it advantageous to adopt the plan which has made England "ruler of the wave," while the United States is still governed by the policy of inaction.

### Launching of the Pilgrim.

The Pilgrim is at last afloat, launched after much tribulation. She stuck on the ways on the 13th, and has resisted three attempts to get her off. The successful one occurred on the 22d. As is usual in such cases, the weight appears to have been greater than was anticipated, and consequently the grease was squeezed out of the ways and burned by the friction of her motion. It seems surprising that in yards where large vessels are constantly being launched such accidents should be allowed to occur. We have seen a large number of vessels stick during launching, and in every case, when investigation was made, it was found that the quality of the grease had been a little soft, some change had been made in its character for the purpose of experiment or economy, or that the area of the ways was a trifle scant. In this case, to effect the launch, the ways themselves were sawed out in 12-foot sections, greased and put back again. Five tugs, a number of hydraulic jacks and a winding engine were all employed as persuaders. When she started, however, she made short work with helps of this kind.

An old builder, who has been launching ships for half a century, says in regard to this failure to launch the Pilgrim that, had castle soap been used instead of cheaper substitutes, the vessel would have gone off on the first attempt, and the saving in money would have been vastly more than the extra cost of the lubricant. It never fails in the hottest weather, and, we believe, is a safe lubricant under the heaviest pressure. An attempt at false economy has been, in every instance save one of which we have any knowledge, the cause of vessels sticking on the ways. The great Eastern stuck on account of a blunder in the management at the time of the first attempt to launch, and a misapprehension of the effect which the weight would have upon the rubbing surfaces. Unfortunately, one such disaster is not always sufficient to teach true economy. In some instances we have known three or four failures to occur in succession. It is to be hoped, however, that in this case the lesson will be learned without a repetition of the failure.

### The Labor Troubles West.

There has been little or no change in the actual status of the iron strike since our last issue, though there are many indications that lead to the belief that important changes are not far in the future. The National Lodge of the Amalgamated Association is in session at Chicago as we write, but nothing definite as to its action has reached us. Besides this, the most important news since our last is the report that the National Tube Works, McKeesport, are to start with non-union men. This announcement caused considerable consternation in the ranks of the Amalgamated Association. The other McKeesport mill, W. D. Woods & Co., is already running non-union, and its successful and quiet operation while the tube works were idle, was a decided argument against the union's methods. It was also well known that if the tube works undertook to run non-union they would succeed at any cost. In their attempt they would be aided by the men in the tube department who are not members of the union, and who have been idle for over two months on account of a matter in which they have no interest. In the meantime, there is no improvement in the demand for iron, and manufacturers would be troubled to get orders were they to start. Indeed, at the present time they could not start at once if the strike was ended.

In another column we give the substance of a bill filed by the attorney of the Bessemer Steel Co., Limited, against Mr. Jacob Reese for an injunction restraining him from selling or transferring any of the numerous patents, the ownership of which is in dispute between him and the Bessemer Association. This is probably the beginning of a very extended litigation. The decision of the Patent Office in favor of certain of Mr. Reese's claims has made the contract of the Bessemer Steel Association with Mr. Reese of more importance than formerly, and the outcome will not be devoid of interest to the entire iron and steel trade of the country.

### A Holley Memorial.

We print in another column a letter from a prominent engineer, discussing the proposed Holley Memorial Bronze, and approving the suggestion of *The Iron Age* that a Holley Memorial Laboratory would be at once a more worthy tribute and one easier of accomplishment, though involving an immensely larger collection and expenditure of money. To a few of Holley's near and dear personal friends, a tribute which should be without a suggestion of utility would be more acceptable than one which was designed to be of practical value to living members of the profession. But this is a practical age, and to interest business men in a project of any kind it must have a beneficent purpose or promise profit. A great physical and mechanical laboratory is needed, and experience has shown that nothing will be gained by dancing attendance upon Congress with bills for appropriations to meet the expenses of a United States test commission. The experiment when tried was only partially successful, and notwithstanding the fact that the bill to create such a commission was this year presented to Congress, with the stringent and most disinterested support which could be given to any measure, the chances of its favorable consideration are infinitely small. The most that will be appropriated is \$10,000, and we do not need to say how hopelessly inadequate this sum would be, if voted. But the discussion to which the bill has given rise in the newspaper press and in the engineering societies of the country, has called attention to the immense importance of a system of investigations based on careful and accurate tests of metals and structural materials. The interest felt among engineers and manufacturers in the information which can be gained in no other way is constantly increasing, and to create in the name of A. L. Holley an institution where such investigations can be carried on for the benefit of engineering science, under the management of committees from the three great technical societies with which Holley was so prominently identified, has an appropriateness so obvious that the idea, if formally presented, would not, we think, fail to receive a hearty support. We hope, as we said before, that the committee having this matter in charge will see their way clear to enlarge their undertaking to these worthy proportions, and that at the approaching meetings of the Civil, Mining, and Mechanical Engineers the subject will be fully discussed and the committees instructed. The Editor has written on this subject as a journalist, and not as a member of the joint committee. He will co-operate heartily with whatever is finally decided upon; but as it is understood that the circular of the committee was tentative, and had for its object to test the feeling of the professions and trades addressed, discussion of the plan proposed is peculiarly timely and appropriate.

### Obligations of Freight Carriers.

In the proceedings before Judge Haight in the Supreme Court Chambers, instituted by the Attorney General, Leslie W. Russell, on behalf of the people against the New York Central and Hudson River Railroad Company, and the New York, Lake Erie and Western Railroad Company, for mandamus to compel the railroads to receive and transport freight as common carriers, a decision was rendered by the Judge, in which he denies the relief sought. The issue of a writ of mandamus, he contends, can only be granted when there is no adequate or complete remedy at law. The railroad companies, in neglecting or refusing to receive and transport freight tendered by a citizen of the State, do not commit a public wrong warranting such a resort. Rather, it is a private wrong, for which the remedy is a suit for damages. Under the statute, "a discretion is given to the corporation to regulate the time and manner for transporting the property that shall be tendered to it." "It is not in the power of the Court to look into the future and determine the kinds or quantities of freight that will be hereafter presented for transportation, and by an order specify how and in what manner the same shall be carried, or what kinds shall take preference."

So far as the application for a mandamus may have been intended to compel the railroad companies to grant the rate of wages demanded by the freight handlers, the judge seems to touch on the question incidentally. One of the authorities which he quotes says: "The duties which devolve upon railroad companies by reason of the exercise of powers conferred by the Government for public purposes, must not be confounded with their obligations as common carriers 'for hire.' As before observed, these latter duties or obligations can be enforced through the usual remedy, by action for damages. It would appear, therefore, that the plaintiffs in the case against the railroads have failed to make the necessary distinctions between what constitutes a public and a private wrong, and that if redress for alleged grievances is obtained, it must be through another court. 'Unreasonable delay' in handling freight must be considered a private wrong. Mr. Simon Sterne, attorney for the Board of Trade and Transportation, intimates that the Attorney-General will appeal to the General Term of the Supreme Court, which meets in October. We think there is abundant ground for such an appeal in Judge Haight's decision, which makes the great, though usual, mistake of placing

### Important.

Graduating are at mathematical and ever engaged. The subject efforts put found at international progress time when attempts began heavenly bodies an important which it never underlies a question why before any in the direction of the subject. The subject dentally thought measurement every mechanical particular division a standard must be by numerous consent engineering large, is of too



corporations enjoying special charter privileges on a plane with private individuals who become common carriers without such privileges. He was also in error in assuming that the object of the application for a mandamus was to compel the railroads to pay the rate of wages demanded by the striking freight handlers. The question was simply, shall the railroads, enjoying exceptional privileges and advantages, be required to render the public service in consideration of which these privileges were granted? It is true that the duties devolving upon the railroad companies, by reason of the exercise of powers conferred upon them by the Government for public purposes, should not be confounded with their obligations as common carriers for hire, but their first duty in consideration of these powers is to discharge their obligations as common carriers. Failing in this, they disregard the prime condition of their franchises. Civil suits for damages resulting from non-performance of their duties as common carriers, do not afford adequate relief. It is not damages, but transportation, the public want and have a right to demand. No amount of damages which could be established would pay for the injury resulting from a partial suspension by the railroads of their functions as common carriers.

#### The Tax Bill in the Senate.

Our readers have already been apprised, through the medium of the Associated Press, of the virtual failure of the so-called "tax bill" in the Senate. This bill, it will be remembered, as it came from the House of Representatives to the Senate provided for a reduction of the internal revenue tax. As amended in the Senate it also provided for a reduction of the duty on sugar, and on steel rails from \$28 to \$20 a ton, and also provided that manufacturers of hoop iron shall pay the hoop-iron duty. Those portions of the bill relating to the reduction of internal taxes had been acted upon in the Senate. The amendment providing for reduction of duties had been under discussion for two days, the sugar portion only being partially acted upon when the further consideration of the bill at present was abandoned and discussion begun on the naval bill. This is generally regarded as shelving the bill for the present session.

The abandonment of the bill was probably due to several reasons. In the first place, some Senators objected to several reductions that were made in customs duties, certain of them opposing the reduction in steel rails and others the reduction in sugar. Again, it was found that the bill was giving rise to such extended discussion that the idea of adjournment was postponed indefinitely, and some of the Senate, and especially members of the House whose nominations were in the balance, were desirous of adjournment that they might attend to their "fences." Still others believed that, as the question had been referred to the Tariff Commission, it was unwise and unjust to single out two or three items in the tariff and subject them to heavy reduction at the present time.

Whatever may have been the cause of the abandonment of the bill, we think it a grave mistake. One of the most pressing needs of the country to-day is the reduction of our revenues. Our surplus is enormous, and probably increasing. It is taking from the industries of the country an amount of money for which we have no use as a nation, and to that extent injuring our prosperity. It is furnishing a surplus for disposal that is an inducement and temptation to Congress to be extravagant, and to become concerned in projects that will bring disgrace and discredit upon us as a nation. Unless something is done to reduce the receipts, as soon as the present bonds which can be paid off are paid, which will be in the course of two or three years, our surplus must either accumulate in the Treasury Department and create a stringency in the money market and financial disaster, or taxes must be reduced so rapidly as to produce similar disaster. The wise, cautious and prudent way is to reduce this internal tax so gradually that there will be no abrupt measures to disorganize the money market.

#### Importance of Correct Graduation.

Graduation and the appliances for graduating are among the most important mathematical and mechanical subjects which have ever engaged the attention of investigators. The subjects are by no means new ones. The efforts put forth in this direction are to be found at intervals in the history of mechanical progress, commencing as far back as the time when astronomy became a science and attempts began to be made to provide accurate instruments for use in investigating the heavenly bodies. Graduation, however, has an importance in modern fine workmanship which it never possessed at any previous time. It underlies all systems of standards, and is a question which must be conclusively settled before any progress whatever can be made in the direction of interchangeability in general machine construction.

The subject of graduation, including incidentally those of comparisons and fine measurements generally, is one in which every mechanic has a direct interest. If any particular division of the yard is to become a standard and be generally adopted, it must be by reason of a practically unanimous consent. The intelligence of the engineering fraternity and of mechanics at large, is of too high an order to warrant the

assumption that whatever may be branded standard will be accepted as such without a challenge. Investigation is the order of the day. Every man desires to know why the standards proposed for adoption are the best that can be offered, and he will accept them only when he is convinced upon this point. No organization or committee, however eminent, can secure the permanent adoption of any system of standards unless their efforts are seconded by an intelligent public opinion.

#### The Holley Memorial Bronze.

To the Editor of the Iron Age.—Your editorial comment, or rather suggestion, which is appended to the report of the joint committee of the three engineers' societies to provide a memorial tribute to A. L. Holley, that the tribute should, if possible, not be confined within the small scope offered by a bronze bust to be placed in Central Park, is sure to be re-echoed and warmly welcomed by a large number of engineers.

Those among us who knew Holley personally—who remember his quiet and simple tastes, his dislike of all empty show and ostentation—who remember the prominent fact in his career, that nothing that Holley ever did or undertook was lost or wasted—cannot but feel that a bronze bust—and of all places in Central Park—is about as anomalous a tribute as could well be paid to the memory of his grand and useful life.

There is something of genuine satire in the idea of selecting Central Park, with its examples of bad architecture and worse engineering, and its collection of atrocious statuary, as the spot on which to place a bust of one of the greatest engineers of our century. Our experience here in New York with bronzes of great men is anything but encouraging. From Union Square, where Washington bids "Avant!" to the ghastly shape in bronze pantaloons on the other side of the square, up to the Mall in Central Park, where Fitz-Green Hallock sits enthroned in supreme hideousness, our city abounds in warnings against sculptorial perpetuation, and the writer, for one, would not like to risk seeing "our Holley" in juxtaposition with, for instance, the piece of stonemason's work, executed in bronze, which the Park Commissioners have labeled "Thomas Moore."

Altogether it seems doubtful if in this utilitarian age of ours the joint committee could interest a sufficient number of us to raise the necessary funds for such a purpose. On the other hand, the idea of a "Holley Memorial Laboratory" would probably find not only no opponents, but a host of friends and advocates, both within and outside of the profession. Aside from the fact that such an institution would, beyond doubt, be the most fitting and most enduring monument to him whose investigations of the properties of the useful metals have done so much toward the industrial development and progress of his country, and have furnished us with so broad a foundation to build further inquiry upon—aside from the no less important fact that scientific investigations carried on under the auspices of the three great engineering societies could be kept wholly free from all political and army influences, the scheme is one which would naturally commend itself most favorably to general and generous support for many other reasons.

Manufacturers, as well as engineers, are fully alive to the importance to all of us of further and more thorough information regarding the mechanical properties of structural materials, and the influences which process of manufacture and chemical composition exert upon the final product, and, like ourselves, cannot but see the utter hopelessness of counting upon any material aid for such a purpose to come from Congress. In illustration of this it is only necessary to remember that thus far only one House of Congress has shown a willingness to appropriate the miserable pittance of \$10,000 for the reorganization of a United States Testing Board, while both Houses promptly concurred in the resolution to devote \$15,000 to the improvement of the "Cheese Quakes Creek," said to exist in New Jersey. The old saying of the French war, *point d'argent, point de Suisse*, transposed into modern Congressional, would read, *point de Boodle, point d'appropriations*; and even if a sufficient amount could be secured for a scientific purpose, the commission would be sure to be more or less hampered by political pulling or the petty grievances of some disappointed army officers. On the other hand, the organization of a mechanical laboratory under the auspices indicated would not only insure swifter and more tangible scientific results, but the results obtained would also command greater confidence.

Of course it would be incumbent upon the committee to elaborate, in the first place, a plan for the organization, management and working of such a laboratory. Upon the proper elaboration of this plan the success of the whole scheme would probably depend. If people are called upon to subscribe for such a purpose they will comply more cheerfully and more liberally if they have put before them a comprehensive plan of what is proposed to be done, instead of a vague idea of remote possibilities interspersed with unfulfilled longings. Let the form of organization be thoroughly well understood—let it be such as to command general confidence and to give assurance that the vital scientific questions of the day, in which the large industries as well as experts have an interest, will receive due consideration—and we can count upon liberal support. Moreover, it would be well to make a full statement of the mechanical appliances, testing machines, laboratory apparatus, &c., which it is proposed to procure primarily. This will not only enable the committee to make a very close estimate of the amount required to start the laboratory, but will also give an indication of the facilities to be offered to iron, steel, bridge and other manufacturers for having tests, experiments and investigations made for their own account, and without interference with the regular scientific investigations to be made at the laboratory. The location of such an institute is also a fair subject for consideration. Close proximity to the great-

est number of industrial interests, and, therefore, greater facilities for personal observation and experiments, is greatly to be desired. In this respect Pittsburgh or Philadelphia would probably prove to be the most desirable locations, and in either of the two places a "Holley Mechanical Laboratory" would be sure of a most hearty welcome and of substantial support.

I fear I am trespassing upon both your space and your readers' patience; but the subject is one in which we are all deeply interested, and I find very many fellow members agreeing with you, that it would be well worth while for the joint committee of the three engineers' societies to try for the attainment of a larger tribute than a bronze bust to the memory of Alexander Lyman Holley, whose life work already claims for him, in the proud words of the poet of old—

"Exegi monumentum perennius ere."  
ENGINEER.

#### The Iron and Metal Exchange Company, Limited.

63 WALL STREET, NEW YORK, JULY 31, 1882.

To the Editor of the Iron Age.—SIR: I take the liberty of asking insertion in your columns of a few, perhaps not highly important, comments on the very able and interesting editorial article in your issue of the 27th inst., entitled "The New York Mercantile Exchange."

In the first place, it is hardly accurate, for purposes of comparison with the other exchanges, to put our membership at 165; this was, to be sure, the number of our associate memberships according to the list published June 9th, 1882 (there have been several additions since that date), but these 165 associate memberships stand for 165 corporations, firms and individuals who are represented in the exchange by 425 persons holding cards of admission, and the latter figure (425) should be the one given for comparison with other exchanges in which the membership is simply personal.

Again, you say, in referring to the organization of this exchange: "The committee appointed by the chairman (of the meeting of February 15, 1882) took the unusual course of organizing what should be an exchange in name rather than in fact."

Whether an association of manufacturers, merchants, consumers, transporters and brokers for the purpose of providing a convenient meeting place, and supplying facilities for the conduct of conservative and legitimate trade, constitutes an actual "Exchange" or not, is, of course, simply a question of definition. Those who remember the Merchants' Exchange, of New York, or are familiar with the working of some foreign associations, such as the Royal Exchange, of Middlesboro', might allow that such an association might logically and properly be called an exchange. But if a mixture of a large amount of speculation in fictitious values with a very small amount of exchange of actual values is necessary for the existence of an exchange, properly so-called, then I must admit that this comment has no ground to rest upon.

You say further, in your discriminating remarks on this exchange and the Pearl Street association: "The business thus far done on the floors of the exchanges does not seem to have been of much consequence."

This is no doubt true of this exchange, so far as open transactions are concerned. But it is also true that the associates are, in spite of dullness of trade and inclemency of weather, fast getting into the way of coming regularly to the exchange rooms for the very purpose for which the exchange was established, namely, to find out what is doing in the trade, and to be at a convenient place where they can meet a number of persons on business, without being put to the trouble of running about town to their offices.

There have undoubtedly been important transactions initiated or consummated, in a private way, on the floor of the exchange, for its members are men of standing in the trade, who actually have merchandise to sell, or actually wish to buy merchandise, and they have not neglected the opportunities which the exchange, even in its infancy, has afforded them.

I make these few comments, not in a spirit of criticism, but rather as supplemental to your editorial article.

Very truly yours, ASSOCIATE.

We print this very courteous letter with satisfaction, always considering it a pleasure to give those who consider themselves misrepresented the privilege of reply and explanation. We disclaim, however, any intention to misrepresent the facts in our editorial article of last week. In a table giving the membership of the various exchanges in New York, it would have been unfair and misleading to give 425 as the number of associate memberships of the Iron and Metal Exchange Co. In a list purporting to give the names and addresses of associates of the Iron and Metal Exchange Co., Limited, we find there are 165 names. The fact that each name represents from one to three gentlemen having the privilege of the floor—2 10-33 to be exact—is interesting, but as only 165, plus as many as have since joined, contribute to the revenues, it was only fair to limit the nominal membership to the subscribers.

As the object of organizing the Exchange Company was probably to forestall the organization of an exchange on the basis of elective management and self-government, it can scarcely be called an exchange in the sense in which that term is commonly understood in this country. In business parlance, the term exchange has come to have a well-defined meaning and significance. The Wall Street room is a convenient and pleasant place of meeting, and the fact that it brings those in the business together between the hours of 12 m. and 1 p. m., makes it a convenient place for negotiations and transactions. Our remarks as to the character and amount of business done "on the floor" referred distinctly, as the context showed, to that done on call. We have no doubt that the business privately consummated is large, and of course it is genuine; that done on call was not large, and much of it was open to the suspicion that it was intended chiefly for effect. If calls had served a useful purpose they would not have been

abandoned, and a majority of the members would not have considered them subversive of the dignity of the exchange.

To correct any misapprehensions, we will say that we consider the Iron and Metal Exchange Co., Limited, an eminently respectable association of business men, which cannot fail, under existing conditions of organization and management, to exert a wholesome influence upon the trade. It does not, however, realize the idea of an exchange, which is probably an advantage, as we doubt if the conditions existing in the iron and metal trades make an exchange possible. One of its most important advantages, it seems to us, is found in the fact that it brings the trades together and affords opportunity and encouragement for intimate personal intercourse. A large daily attendance will insure its permanence and success, and if this can be maintained it will probably come as near being an iron and metal exchange as the trade has need of.

#### National Convention of Iron and Steel Manufacturers.

At a meeting of the Board of Managers of the American Iron and Steel Association, held at Bresson, Pennsylvania, July 25, 1882, the following preamble and resolutions were unanimously adopted:

Whereas, The tariff commission recently created by act of Congress has requested all of the organizations of the country which represent its leading industries to appear before it by committees or otherwise to give testimony and to make suggestions concerning the proposed revision of duties on foreign products; and

Whereas, The American Iron and Steel Association is a national organization of long standing, which represents such leading branches of our iron and steel industries as embrace the manufacture of pig iron, the manufacture of blooms, the manufacture of all rolled iron, cut nails and forgings, and the manufacture of all kinds of steel; therefore be it

Resolved, That a national convention of all the iron-ore producers and the manufacturers of iron and steel in the United States, and of all who seek to establish in our country the manufacture of tin plate, be held at the Mountain House, at Cresson, at 12 o'clock on Tuesday, September 12, 1882, to consider the whole question of duties on iron ore, iron and steel in their various forms, and tin plate, and to adopt a schedule of duties thereon to be submitted to the Tariff Commission for its consideration.

Resolved, That the convention, immediately after its organization, shall be divided into sections, each section to represent a distinct branch of the iron and steel industries of the country, including the production of iron ore. Each section will at once separately proceed to consider the existing duty or duties which affect the branch of manufacture or production in which its members are interested, and the conclusions which it reaches shall be submitted in writing to the general convention. When all the sections shall have submitted to the convention the result of their deliberations, the several rates of duty proposed shall be considered *seriatim* by the convention and amended or approved, as the case may be, after which the whole schedule of duties agreed upon shall be ordered to be transmitted to the Tariff Commission as the voice of the united iron and steel industries of the country.

Resolved, That the complete schedule of duties agreed upon by the convention shall be laid before the Tariff Commission by a committee which shall be composed of one representative of each branch of the industries represented in the convention, each section of the convention to choose the representative of the branch with which it is identified. The committee shall also present to the Tariff Commission a report in writing or in printed form which shall embody the reasons governing the convention in the adoption of the schedule.

Resolved, That we earnestly request a full attendance at the convention of all iron and steel manufacturers and iron ore producers, and of all who desire the establishment of the tin-plate manufacture, and that we further request that those who may attend to come prepared to remain long enough to conclude the important work for which the convention is called.

Resolved, That we recommend each local iron and steel or iron ore organization to meet at as early a day as possible, and in advance of the meeting of the national convention, for the consideration of the duties in which it is specially interested, so that when the convention assembles each branch of the iron and steel industries represented may be prepared to expedite the business of the convention; and it is also recommended to the local organizations, for the further dispatch of the business of the convention, that they prepare in written or printed form arguments and statistics sustaining the positions which they may assume.

Resolved, That the president and secretary of the American Iron and Steel Association be authorized to communicate to all iron and steel manufacturers and iron ore producers the action of this meeting, and to transmit to them also copies of existing duties on all iron and steel products and on iron ore, accompanied by appropriate references to adverse decisions by the Treasury Department and the courts affecting these duties. By order of the Board of Managers.

D. J. MORRELL, President.  
JAMES M. SWANK, Secretary.

The telephone lines in St. Louis are getting to be so numerous that the company is carrying many of them along the principal streets in cables. A stout iron wire one-eighth inch in diameter is stretched from pole to pole, and along this is carried the main cable, attached to the other by zinc saddles about 2 feet apart. Each cable is composed of 36 copper wires, insulated from each other by kerite, and covered with tinfoil to prevent induction. The compound cable is about an inch in diameter. The tinfoil covering of each is connected with the ground. The outside is covered with kerite tape. It was expected that about 2000 feet of such cable would be up by the end of the month. It is intended shortly to put up a couple of lines

of Patterse cable, which consists of the usual copper conductors inclosed in a lead pipe. The space remaining in the pipe after the wires are inserted is filled with hard paraffine wax at in under great pressure. This is about one-half as costly as the kerite cable, though much more cumbersome, the kerite line costing about \$125 per mile.

#### American Institute of Mining Engineers.

We have just received a circular, issued by the secretary of the American Institute of Mining Engineers, announcing that it has been impossible to obtain as low special railway rates for the Denver meeting of the Institute as we confidently expected. Owing to the Denver Mining Exposition, which will be open at the time of the visit, excursion rates to Denver, obtainable by everybody, have already been fixed, and the railway companies have declined, under these conditions, to make special arrangements for the benefit of members of the Institute. From this cause, principally, has resulted the necessity for Eastern members to purchase tickets first to the terminus of a trunk line, and from such point to Denver, the tickets being obtainable, on presentation of card orders, at the rate of two cents per mile. The card orders may be procured by applying to the secretary of the Institute, and each should be filled out with the name of the station where the ticket is to be purchased, and the name of the person (whether gentleman or lady) who is to use it. The latter name must be furnished by the secretary in advance to the ticket agent at the proposed station. Hence, members applying for cards should do so at once, giving full particulars. The tickets may be so taken as to permit the purchaser to go by one route and return by another, both being specified at the time of purchase. They are not transferable, and must be stamped by the ticket agent in Denver for return use, after which they are good for five days, but not in any case later than October 31. The cost of the trip from New York via Pittsburgh and St. Louis, and return, apart from meals and hotel expenses, will be \$113, including the cost of sleeping cars, while according to ordinary rates it would amount to \$139. The officers of the Institute directly connected with the subject of transportation had diligently applied themselves to the task of securing all possible facilities, and the disappointment experienced cannot be attributed to any lack of effort on their part.

#### WASHINGTON NOTES.

(From Our Own Correspondent.)

WASHINGTON, D. C., August 2, 1882.

JUDGE FRENCH AND THE ASSISTANT SECRETARYSHIP.

It appears that the crusade which was carried on some months ago against Judge Henry French, of Massachusetts, incumbent of the responsible and difficult office of Assistant Secretary of the Treasury, has been revived. There seems to be an irreconcilable conflict between the protective tariff interests and Judge French. It was supposed that the two forces had reached an understanding, and that this efficient officer would remain, but the original movement, reinforced by new forces, has again been set in motion, with what success time only can tell. So far Secretary Folger has opposed all efforts to make a change.


#### THE CANDIDATES FOR THE OFFICE.

There are this time two candidates for the office, the one is Mr. Umstead, of Pennsylvania, the other Mr. Decker, of Colorado. Mr. Umstead has served in the Legislature of Pennsylvania and on the Bench of that State, and is a man of undoubted ability. He is very generally supported by the Pennsylvania influence, though he seems to have had this before, but it amounted to nothing so far as accomplishing any results were concerned. Colonel Decker is a native of Illinois, though a resident of Colorado. He was United States District Attorney there, and a very efficient one too, it is stated. The two Colorado Senators, Hill and Chittcott, are working industriously for him, and it is intimated that Senator Logan is also lending a hand. It is not improbable that the antagonisms generated by these rivals for the place may redound to the benefit of Judge French. There are no indications at present that Judge French will be superseded very shortly.



#### MR. FRENCH ON THE TARIFF.

In connection with the efforts made to displace Mr. French, it might be stated that a few days ago he left for Long Branch in order to give the Tariff Commission the benefit of his information and experience in matters relating to the assessment of duties, the appraisal of imported articles, the conflicts of rulings from time to time by different administrations, and also the entire divergence among the judicial tribunals in their adjudication of questions involving the same facts and coincident principles, which looks very much as if local interests had about as much to do with the decision as any points of law or fact. Before leaving he went over his views on the subject quite freely with the correspondent of the Iron Age. His main point before the commission seemed to be to show the importance of simplicity in the arrangement of tables and classification, and above all the embarrassment frequently springing from ambiguity of terms. From the decisions of collectors and appraisers in the classification and valuation of imported articles there were frequent appeals to the Secretary of the Treasury, and this branch, Mr. French said, he had charge of. From these decisions the disappointed party frequently took appeal to the courts, and cases were on record where the New York courts decided one way, and the New Orleans courts the other, on the same question. He did not know whether justice differed in her view of matters, but it certainly was embarrassing and confusing, to say the least. He said that during Secretary Sherman's term as Secretary of the Treasury no less than 18,000 appeals had been made to the department. He hoped the commission would be able to so adjust the duties, especially on iron and steel, where the most difficulty had been experi-





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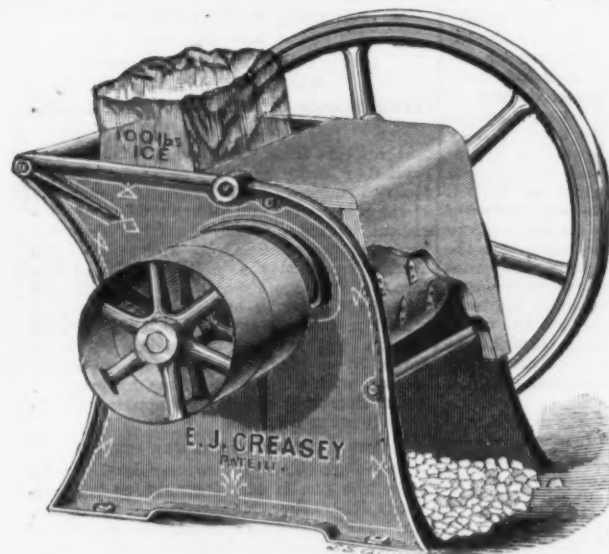
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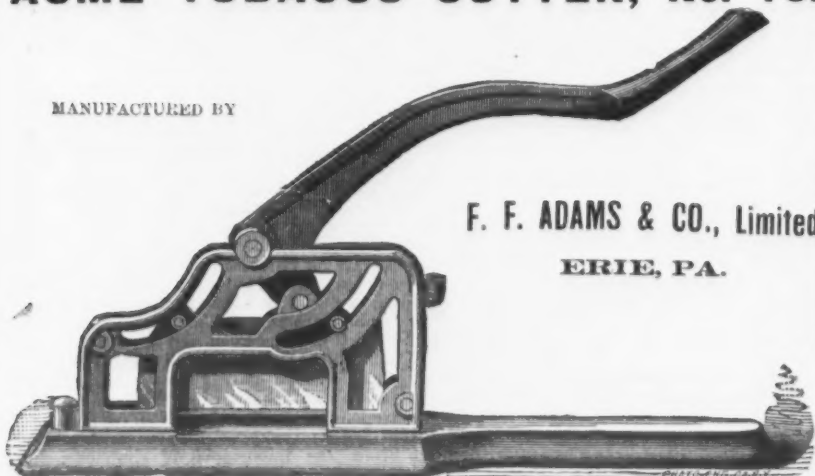
GENTLEMEN:—In regard to yours of March 25th, would say that in addition to the one bought of you in 1880 to run by hand, we bought one in 1881 to run by steam, and run through it 17 tons in less than two hours (No. A). We are now using both in different places, and like them very much. They are a much better machine for the purpose than any I have yet seen. Yours, truly,

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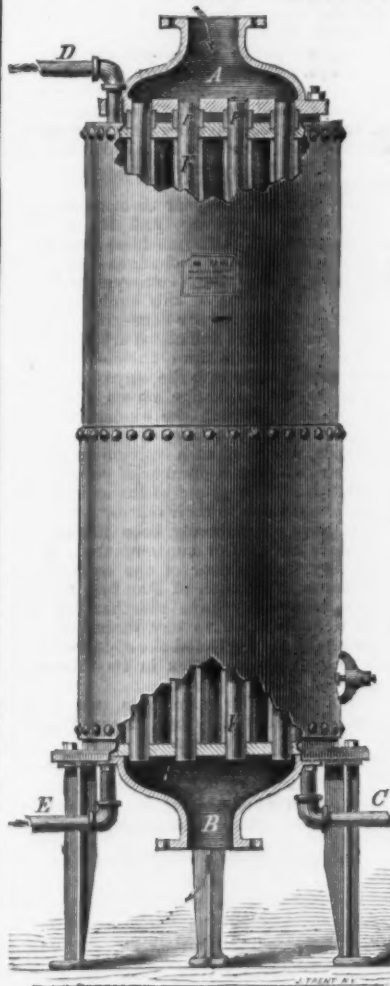
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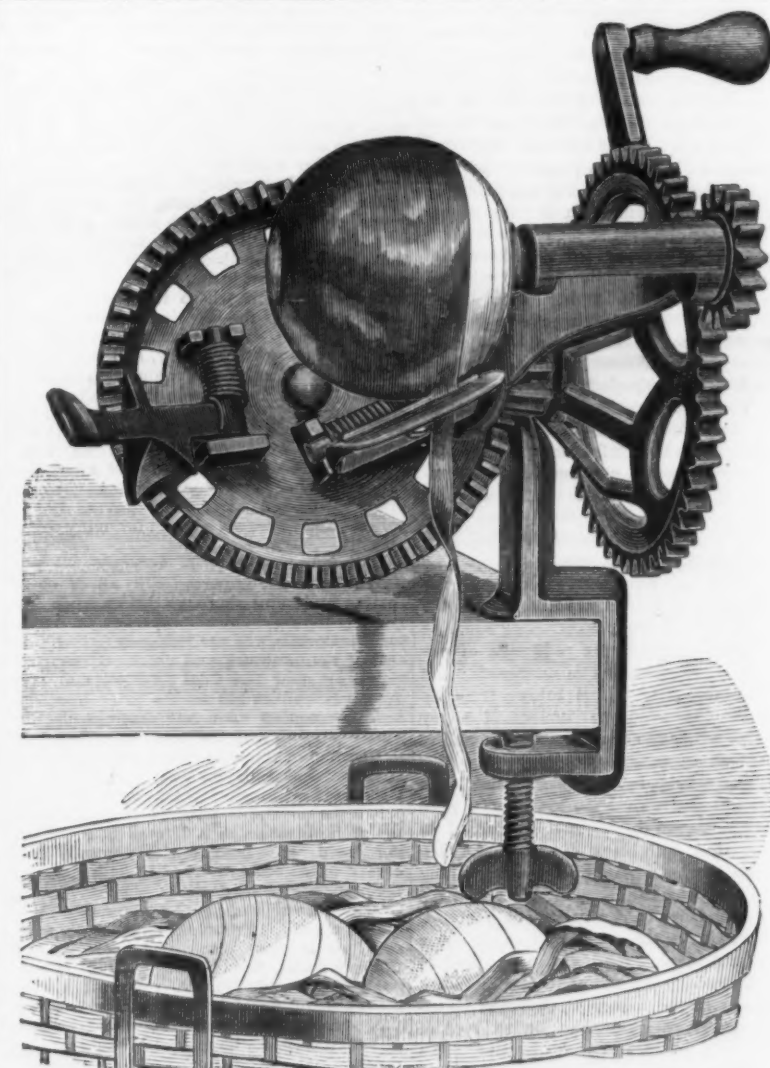
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It has been too wet to call and see you, but we remind you that the continued "spell of weather" has increased the sale of Hill's Triangular Hog Rings over 27 per cent.



#### DAMP.

Dec. 1881.....	418,650
Jan. 1882.....	3,224,375
Feb. ".....	1,843,250
Mar. ".....	3,016,700
April ".....	1,401,100
May ".....	1,406,400
TOTAL.....	10,606,475

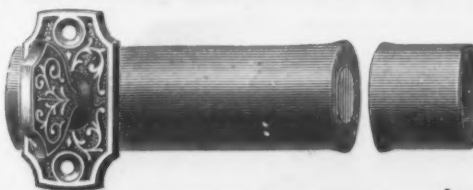
#### DRY.

Dec. 1880.....	142,050
Jan. 1881.....	1,676,700
Feb. ".....	1,335,020
Mar. ".....	1,810,700
April ".....	1,951,700
May ".....	1,378,120
TOTAL.....	8,391,290

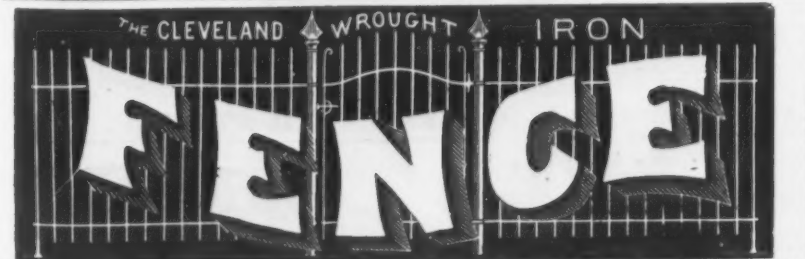
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ended, that these inconsistencies might be remedied. He referred to the steel tariff as having been framed in 1864, that the general idea was that the rate should be from 35 to 40 per cent. ad valorem. Mr. Oliver called attention to the fact that gold was then at a high premium, making that ad valorem rate equivalent to 70 per cent. Mr. French said that this was true. That then Bessemer was almost unknown, and as steel cost about 7 cents per pound, a specific duty of 2 1/2 cents per pound was equal to about 35 per cent. ad valorem. Bessemer steel now costs about 1 1/2 cents per pound, therefore an ad valorem rate of 35 per cent. would be a low rate. He further elaborated his position, and showed that the above changes of value were the principal cause of the controversies as to classification between steel and iron. He then took up the article of cut hoops and cotton ties, and went over the endless litigation on the decisions on these articles. Judge French repeated there what he had said here, that these were the causes of the controversies, and above all things it was important for the commission in preparing a system of tariff for legislation to avoid ambiguity and uncertainty in terms and schedules. Judge French, according to the published accounts, went over the ground very fully, taking up all of the leading articles about the appraisement and classification of which there has been more or less controversy. No one is better able to talk on the subject than he, and the members of the commission desired to get his views before going any further.

#### A FLING AT THE TARIFF COMMISSION.

Mr. Van Wyck, a Senator from Nebraska, a few days ago surprised the Senate by the introduction of the following resolution: Whereas, the Tariff Commission, from its headquarters at Long Branch, on two occasions has impudently appealed to the public for information and no response been made thereto;

Resolved, That the Attorney-General (as soon as in his judgment he can prudently withdraw his personal attention from star-route prosecutions, and shall have fully satisfied the President and his Cabinet that Members of Congress are not officers of the Government, and as to the legality of political assessments) be directed to proceed to Long Branch to aid the said commission in determining the above important question, and other problems of equally grave import as they shall arise from time to time, and that he shall advise what to him may seem proper to protect the said commission from imposition by men wise in matters of trade and revenue, either by stringent oaths or pains and penalties.

It will be remembered that Van Wyck was not only a bitter opponent, in the Senate, of the Tariff Commission bill, but before that made a speech which his constituents did not indorse, having been susceptible of a free trade construction, in which they took no stock. Its erratic author has ever since been trying to convince them that it was not intended for a free trade boom, but was protection all through. This resolution created quite a stir in the Senate, as it was regarded as trifling, and was promptly "sat down upon," as the saying goes.

#### DISPOSITION TO UNDERMINE THE TARIFF COMMISSION.

It is apparent, from the general tendency of a number of gentlemen in one or the other branch of Congress to make light of the efforts of the Tariff Commission, that when the results of their labors come before Congress for public discussion they will be subjected to severe and searching criticism. The opponents of this plan of disposing of the tariff question are extremely bitter. The commission will certainly labor under no small disadvantage, largely on account of the shortness of the time in which to gather their information, and to carefully digest it preparatory to the preparation of their report. They propose, however, to do their best under the circumstances.

#### THE INTERNAL REVENUE AND TARIFF BILL.

In the Senate the discussion of the Internal Revenue and Tariff bill was continued after the close of this correspondence last week. The sugar interest and its opponents continued a somewhat spirited debate on Dutch standards, polariscopes and other matters appertaining to the complicated system of taxing sugar. As a rule when Senators, and members worse, get to discussing questions bearing upon the assessment of duties on such articles as sugar and iron they get into deep water, and generally demonstrate how little they know of the vital principles involved. As Bayard said, the establishing of a new basis for the sugar duty is a large question. This, however, did not frighten any one and the discussion went on until terminated by adopting a reduction amendment.

The Senate then proceeded to the consideration of an amendment providing for a discount of 10 per cent. after January 1, 1883, and an additional discount of 10 per cent. after January 1, 1884, to apply to all taxes and customs duties imposed by laws now in force.

Mr. Vance, of North Carolina, indulged in some remarks which were almost incendiary in their character, being calculated to incite the American laborers to greater discontent than many of them even now exhibit. He said: "There is a day of reckoning coming so sure as we all shall live to see it. You cannot always fool people by saying that the high tariff is kept up in the interest of American labor. That is the invariable excuse. We want the tariff kept on because we want to protect American labor against foreign labor. If I were going forth as the apostle of free trade, I would not go to the fields and the agriculturists. I would go to the factories of New England and iron forges of Pennsylvania and talk to the men there. American labor simply means the pocket of the American capitalist. They are already beginning to open their eyes." The Senator kept up this sort of harangue for some time,

and was vigorously taken to task by Senator Hoar.

#### THE REVENUE AND TARIFF BILL SET ASIDE.

It being apparent that the discussion of the bill would be protracted beyond all reasonable limits to the delay of the appropriation bills, Mr. Hale on Wednesday made his expected motion to take up the naval appropriation bill. Mr. Morrill, who had charge of the revenue bill, said that if that motion should prevail, he hoped that it would not be by votes on his side of the chamber. He then proceeded to give a very fair and concise resumé of the bill as it came from the committee and the different amendments proposed. He said that the bill was such as should have received consideration and final action in one day. The first part proposed to repeal the stamp taxes and leave nothing of the internal revenue but the tax on circulation of banks and upon whisky, tobacco, ale and beer. He said when the bill came into the Senate the only fault found with it was that it did not go quite far enough, and to gratify this desire it was agreed to report a reduction on sugar and Bessemer steel. Mr. Morrill said that all he asked was a vote, instead of which, the other side heaped up amendments and entered on a wide and often irrelevant debate. He then said that he desired to call attention to the 40 amendments, selecting some of those submitted by the other side of the chamber; that the Senator from Kentucky (Beck) had an amendment to reduce the duty on Bessemer steel from \$28 to \$14; that the Senator from Mississippi (Mr. George) proposed to reduce the duties upon a great many articles of ironwork, like wrought iron, nuts, iron bars, rails for railroads, boiler iron, railway bars, &c., to 7-16th of 1 cent per pound; that the Senator from Kentucky (Beck) had a radical measure in favor of free ships; that the Senator from North Carolina proposed to reduce the duties one-half upon "all vessels of cast iron, stoves, and stove plates, cast-iron butts and binges, and hollow-ware glazed or tinned." This set up a general debate somewhat after the style of an experience meeting, in which one side tried to throw the blame on the other.

Senator Maxey said that for the year ending Dec. 31, 1879, the importations of Bessemer rails at the port of Galveston amounted to \$340,000, and for the year ending Dec. 31, 1880, \$3,776,916. He then attacked the eight Bessemer steel companies in the United States, because they were not able to make rails fast enough, and the companies in Texas would rather pay the duty than lose the 10,240 acres of land the State gave them. He then spoke quite elaborately on the interest of the South in free hoop iron, adding the following data: "This bill under review professes on its face to be a bill for relief and for the reduction of the taxes of the people, and it is a remarkable fact that the only people in all this country whose taxes are increased by this bill are the people whom I, in part, represent. You may look to the fifth section of the bill, and the increase which the people of the South pay on cotton ties is 150 per cent. I will show that: Hoops, cut to lengths, splayed and punched, are worth per ton, free on board a vessel at Liverpool, £7. 10/2, equal to \$36.60--that is, all charges paid, ready to come to the United States. The present duty is 35 per cent. ad valorem, which is \$12.81 per ton. The amendment of the Finance Committee will make the duty 1 1/2 cents a pound. Let us see the effect of that. The general average of the annual cotton crop made in the South is 6,000,000 bales. Of that 6,000,000 bales the State of Texas raised a little over one-fifth, or 1,200,000 bales last year. As I have said, the average crop of the South is 6,000,000 bales. Now there are six ties to each bale, and the aggregate weight of those six ties is 11 1/4 pounds to the bale, equal to 67,500,000 pounds of iron used in baling the 6,000,000 bales of cotton, or 30,134 tons at 2240 pounds per ton. The present tax is \$12.81 per ton, equal to \$386,016.54. The proposed tax of 1 1/2 cents a pound is equal to a tax on a ton of 2240 pounds of \$33.60. The tax on 30,134 tons of iron at \$33.60 is \$1,012,502.40. The tax which we now pay is \$386,016.54. The increase therefore by this amendment on the single item of cotton ties to the people of the South is \$626,485.86, or over 150 per cent. increase, and this is called a bill for the relief of the people!"

#### THE VOTE ON THE MOTION.

After some sparring, at the expense of the Chairman of the Finance Committee, who was twitted as having "delivered the funeral oration upon the bill, and retorted that it would be a lively funeral oration before he was through, the vote was taken. The 33 years were made up of 27 Democrats and 6 Republicans, namely, Hale, Hoar, Ingalls, Kellogg, McMill and Plumb, and the 26 years were Republicans, including Davis, of Illinois and Mahone, of Virginia. The motion having been carried, the Internal Revenue and Tariff Bill gave way to the Naval Appropriation Bill.

#### THE APPROPRIATIONS FOR 1882-3.

The force of the determination of the Republicans to pass the proposed reduction of taxes is shown by the enormous increase of public expenditures. In 1881-2 the total appropriations were \$216,694,388. In 1882-3, the present fiscal year, they reach \$294,573,000, which does not include the payment of the principal or interest of the public debt. In 1880-1 the total appropriations were \$190,000,000. The great increase of the present year was occasioned by the Pension, River and Harbor, Miscellaneous and Deficiencies.

#### PROBABLE FATE OF THE BILL.

Senator Morrill indicates a purpose to attempt to bring the Internal Revenue and Tariff bill up again, if for no other purpose than to give it a fair test, and to expose the opposition to it by placing them squarely on record. The Senate may give him an opportunity, but there is not much inclination to waste more time here.

Cast iron containing too much phosphorus to be good for articles requiring strength, may be advantageously employed for the production of ornamental and other castings in which sharply-defined outlines are desirable.



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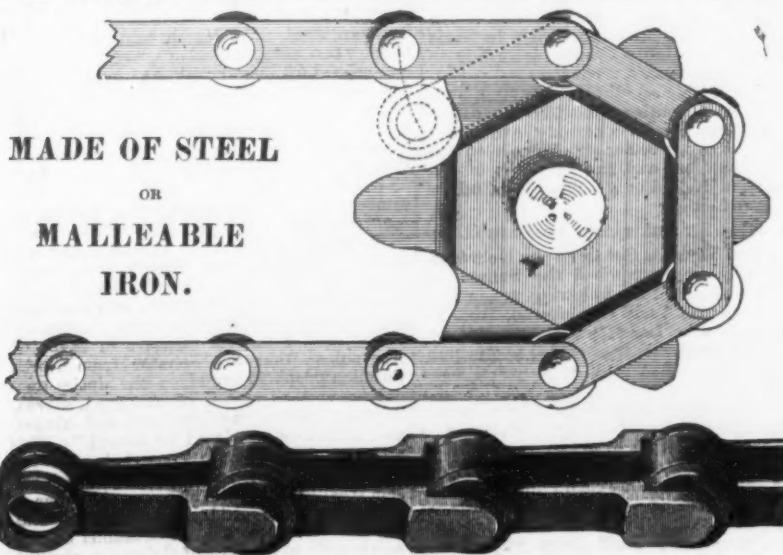
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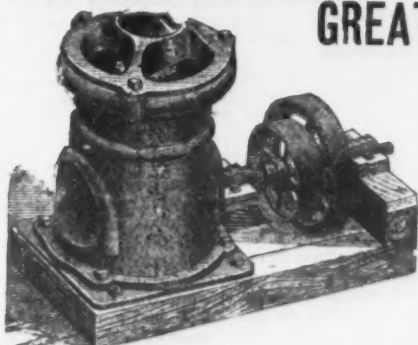
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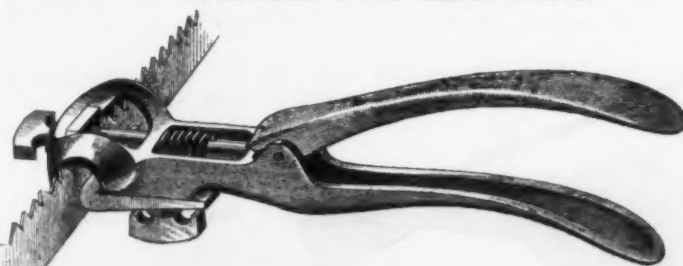
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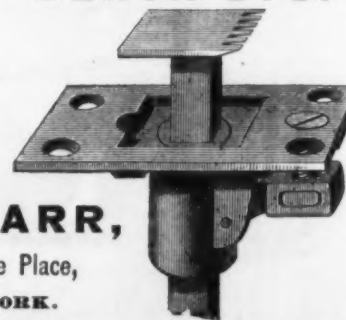
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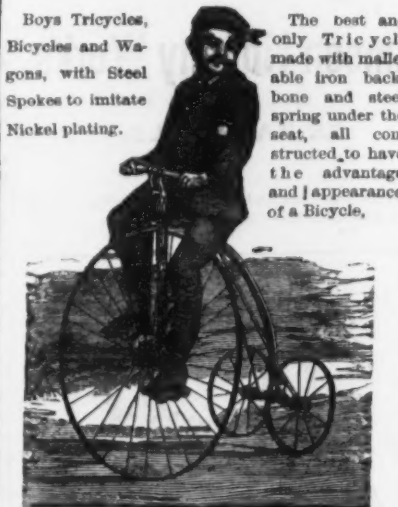
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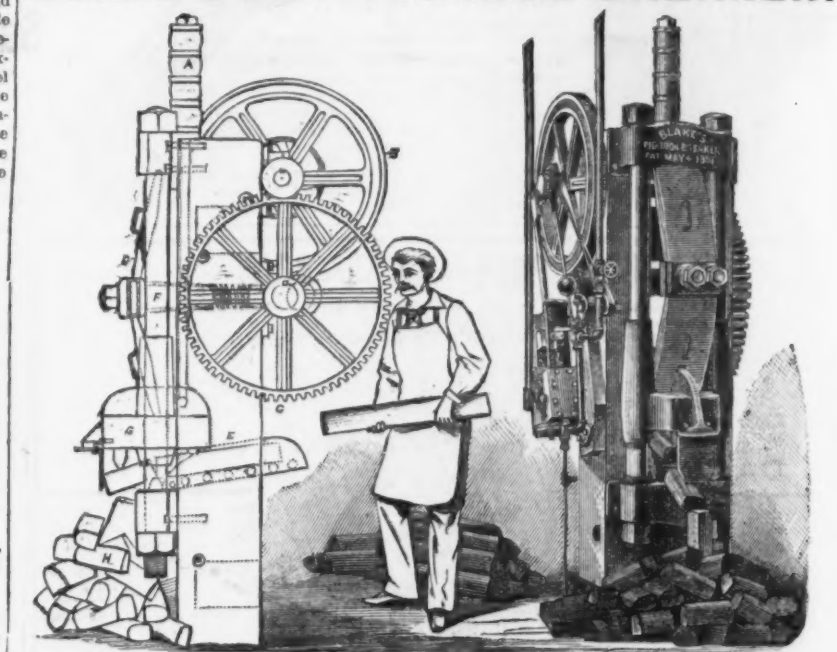
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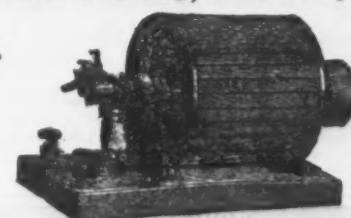
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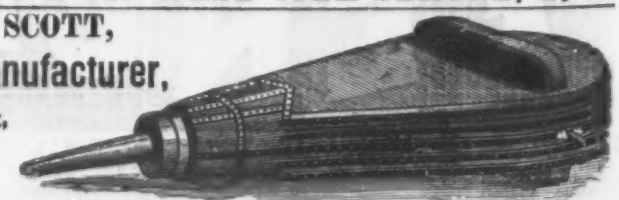
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## Secor's Screw Machine.

We give herewith a general view of a screw machine, with details of construction, designed by Mr. Jerome B. Secor, of Bridgeport, Conn.

This machine, as will be observed, is of elegant and symmetrical proportions, and the details are extremely interesting from the nicety of adaptation of means to ends

thus prevents the undue wear common to those devices. The star wheel for revolving the turret is solid with the taper spindle, which fits the eye of the turret; the star and the stud are hardened, and the taper is ground. The tripping, locking and shifting devices are of steel, and are all large, simple and durable. The locking device is provided with gibs, and has a tapered fit in the tapered notches in the steel-locking ring on

thimble D, a strong friction is had on the collar B, which is ample to keep the screw from turning while in use as a stop, although it permits the screw to turn easily enough when a wrench is applied to the square end. Precisely the same device is used at the other end of the slide to stop it in the opposite direction.

The requisites for the chuck of screw machines are as follows: instantaneous action

of C and of F are at a right angle to the chuck axis. Hence in gripping the rod or wire there is no tendency to move it endways, as there is where the gripping jaws have, as in many machines, a certain amount

of end motion while closing. When this end motion exists, tightening the jaws upon the work draws it away from the stop in the turret and impairs the adjustment for length of work. The gripping jaws are closely guided in slots in D and in A, and

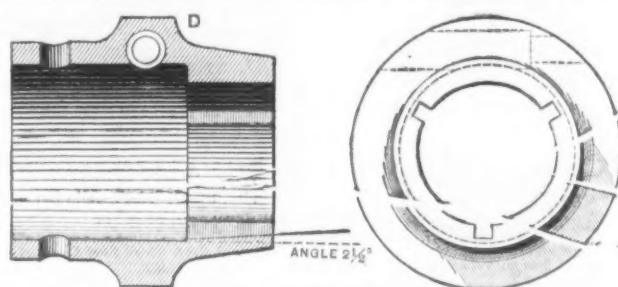


Fig. 5.—Shell of Chuck.

adjustment become impaired at the hands of the operator.

Fig. 7 represents a top view of the turret and slide, and Fig. 8 a view of the lower side of the same and of the apparatus which produces the revolution of the turret. Fig. 9 represents a sectional view of the same taken at A B, Fig. 8. O represents the body of the slide, which is grooved at the sides to receive the gibs X, which secure it to the base P, on which it slides. P is clamped in its required

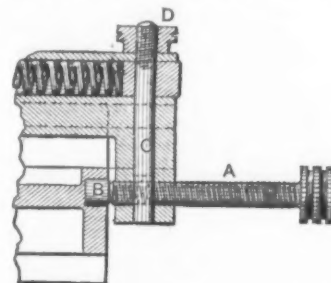


Fig. 6.—Stop Adjustment and Lock.

three sets of these jaws are necessary to cover a range of work from the full diameter of the bore of H down to zero. The capacity of each of these sets of jaws, however, may be varied as follows: The adjustment ring B is threaded upon A, and may be operated along A to move C endwise by means of the tangent screw E, whose threads engage with

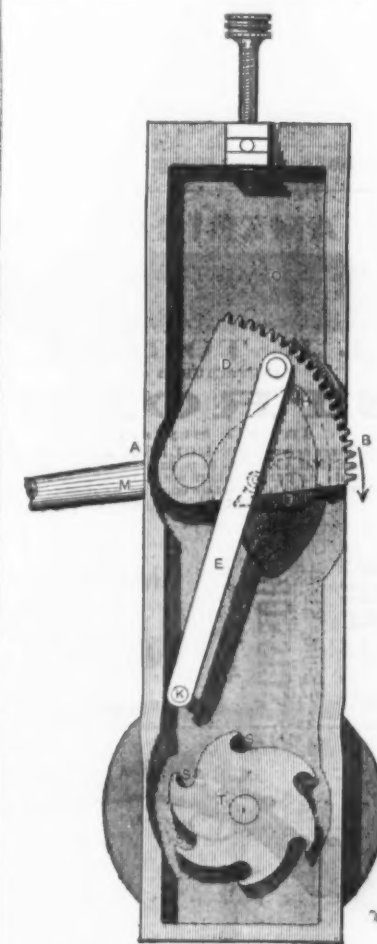


Fig. 8.—View of the Lower Side of the Slide, showing the Parts which Revolve the Turret.

or adjusted position on the bed by the screw S and gib shown by dotted lines across P. Fig. 7 represents a disk located just below the turret, which is perforated with 6 holes of such size and shape as to receive the end of the lock-bolt L. E is a lever, by means of which motion is conveyed from the segment D to the ratchet-wheel T.

The corresponding parts in these three views are lettered the same, so that their connection may be easily traced by an inspection of the cuts. By the backward movement of the handle M the turret is drawn back from the work and at the same time is revolved one-sixth of its circumference, and is returned again to its former position by the forward movement of the same handle. The machinery which revolves the turret by this

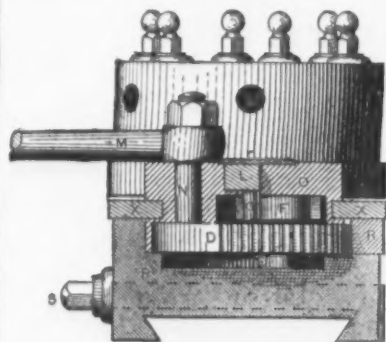
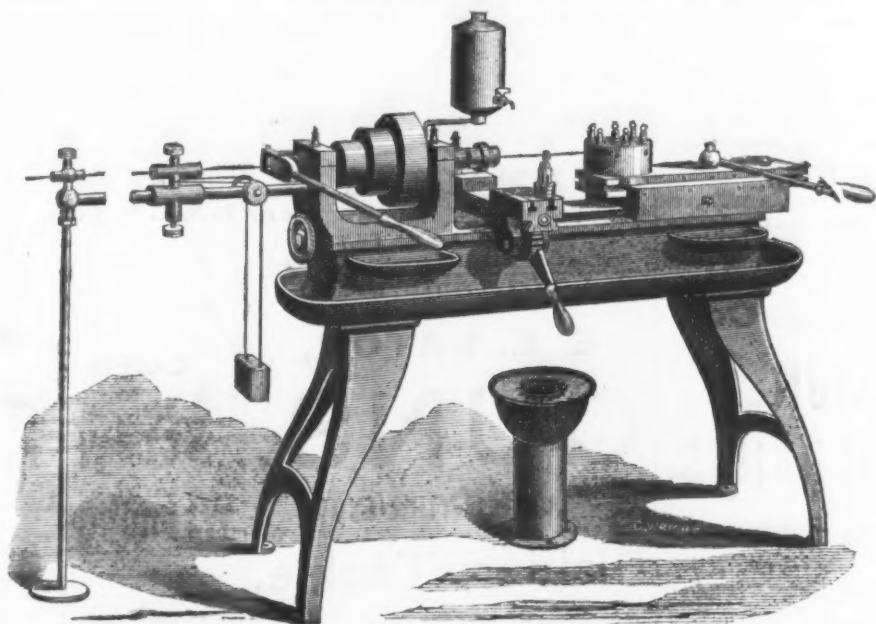


Fig. 9.—Sectional View through the Slide taken at A B of Fig. 8.

motion of the handle is herein shown and may be described as follows: The slide O in the three views is a solid casting, and has on its under side a cavity to receive the segment D, as will appear in Fig. 9. The central portion of the slide is further recessed to receive the cam F, shown in all the views. The segment D is connected with the handle M by the pin N, and is put in motion by the same. Upon the handle being moved backward the segment begins its motion forward, as indicated by the arrow in Fig. 8, thereby moving the slide backward upon the gibs by the working of its cogs into the rack R (Fig. 9), which is attached to the base P. When the segment D has accomplished about one-half its motion the pin H, which is on the upper side of the segment D, comes in contact with the projection or lug on the side of the cam F, as shown by the arrow head in Fig. 8, bringing the opposite side of the cam against the pin G, thereby moving it backward, compressing the spring U, Fig. 7, and drawing the bolt L from its



New Screw Machine.—Designed and Built by Jerome B. Secor, Bridgeport, Conn.

throughout. Particular attention has been given to the adjustments and stops, which are all of the most perfect description, neither gibs nor check-nuts being employed, except in a single instance, the latch which latches the turret in position having a substantial gib held in place by three set-screws to compensate for side wear. This latch, it should be noted, is left in most screw machines without any arrangement whatever for taking up the wear. Decidedly novel features are introduced in the chuck, in the turret-revolving and latching-up mechanism, in the wire feed, and in the method of transferring the motion of the hand-feed levers to the cutting-off slide and turret slide. The bed of the machine, the gutter for catching oil and the head-stock, are all one piece of casting. The steel spindle is hollow, and its journals are ground. The boxes are lined with Babbitt, so that no other metal touches the spindle, and may, by a special device, be re-Babbitted and bored exactly parallel with the planing of the bed. The cone is large, and carries an ample width of belt. A steel collar, J, Fig. 3, between the front end of the forward box and the spindles receives the thrust due to the cut, and a nut on the spindle acts against the cone to adjust it forward on a feather, K, in the spindle to take up end wear. The wire or rod from which the work is to be made is passed through the spindle and collar on the stand, and is held by a thumb-screw in the collar, which is influenced by the weight and cords, so that when the wire is released in the chuck the weight pulls the collar and wire forward, forcing the wire out through the front end of the chuck until it comes against the stop in the turret, which gauges the length needed to make the piece required. From time to time, as the rod is used up, the thumb-screw in the sliding collar is loosened, and the collar is shoved back on the rod as far as it will go, and the set-screw is again tightened.

The turret slide is operated by the usual hand-lever, but the motion is transferred from the lever to the slide by a pinion moved by the lever, which pinion works in a stationary rack in the tail-block which carries the turret slide. This pinion is located inside

the under side of the turret, so that all wear can be taken up. The turret slide can be fastened securely, when it is desired to hold it stationary, by means of a single set-screw.

Lengthwise adjustments of the cutting-off slide are effected by the hand-wheel shown at the back end of the machine, and a screw which passes under the head-stock, and is

by a single motion of the operator, small outside diameter, range of adjustment from O to full size of hole in spindle, firmness of grip, durability. All of these points are fully covered in the chuck of the Secor screw machine.

Referring to the engravings, Fig. 3 is a sectional view of the complete chuck and front

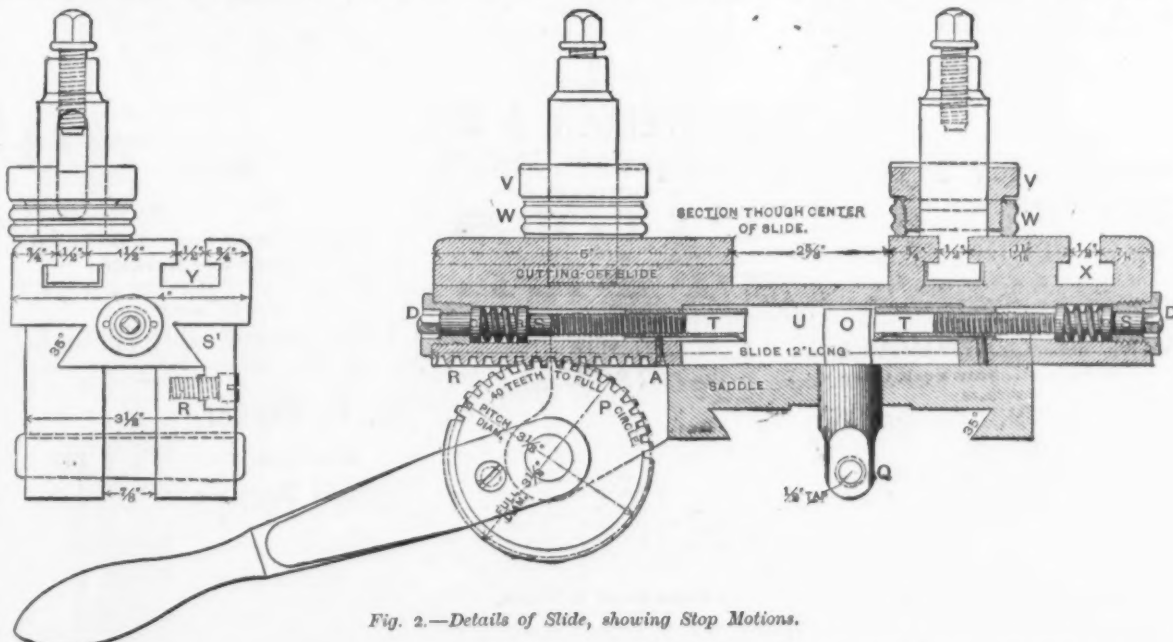


Fig. 2.—Details of Slide, showing Stop Motions.

tapped into a stud, Q, Fig. 2, projecting downward from the cutting-off attachment through slot in the bed. This stud also has an upward projection, O, into a recess, U, cast in the bottom of the tool-post slides, and makes an abutment for the stop-screws S. Every one who has had charge of screw machines understands the difficulty of adjusting the stops so as to bring a tool-cut to an exact

bearing: Fig. 4 is a section and end of the cone; Fig. 5 is a section and end of the shell; and Fig. 6 shows the device employed to lock the stop on the turret. The screw A abuts against the stop B in the usual manner; it is, however, threaded through the eye of a bolt, C, as well as through the end of the turret slide, so that it may be locked by simply operating the nut D. Thus the use of a

teeth parallel to the axis of B, and running across its width all around its circumference, hence rotating E, rotates B, causing it to move along A, and carry C beneath F. By this method of adjustment F need be given only enough motion to and from the chuck axis to grip and release the work, and the

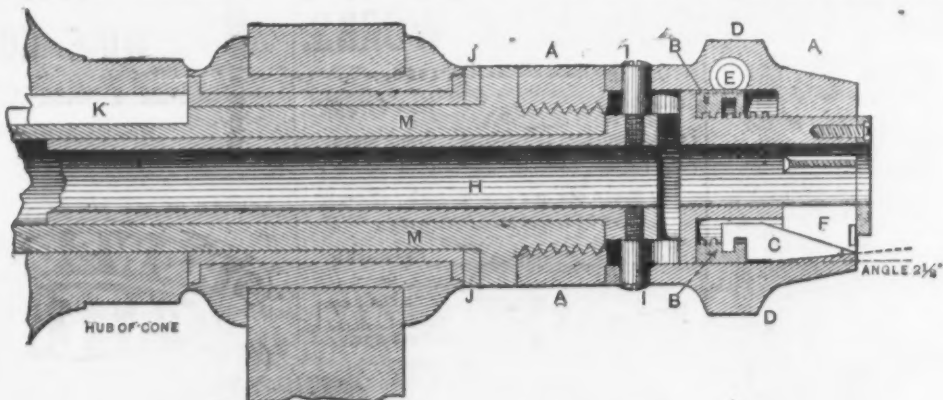


Fig. 3.—Section of Front Bearing and Chuck.

the turret slide, and has a solid stem with a tapered end projecting above the top of the turret slide. The hand-lever has a tapered eye to suit the end of the spindle, and is secured by a nut. By slackening this nut the hand-lever may be moved to any desired position to suit the requirements, and securely

outside diameter, because it is almost impossible to lock the adjustment nuts on the stop screw without repeated trials to find the correct location.

By the simple and elegant device shown in Fig. 2, the adjustment in this machine is effected by simply moving a screw until the

wrench is obviated, and the adjustment is more readily effected. The parts are designated by the same letters in the several views.

In Fig. 3 M is a hollow spindle, within which is the hollow spindle H, through which the rod or wire to make the work passes. It is prevented from end motion by the cone hub on one side and the collar J on the other side of the bearing, while H may be operated endwise within M by means of the hand-lever shown on the left hand of the head-stock in the general view. The core A of the chuck screws upon M, and is threaded to receive the adjustment nut B, which receives and holds the adjustment wedges C at their ends by the talon shown. The shell D is secured to H by the screws I, which pass through slots in A, and therefore move endwise when H is operated by its hand-lever. Now the mouth of D, against which the adjustment wedges C rest, is cone 2 1/2°, as marked; hence the end motion of D to the left causes C, and therefore F, to approach the axis of the chuck and grip the rod or wire, while its motion to the right causes C, and therefore F, to recede from the chuck axis and to release the wire. Since B is screwed upon A, and C is guided at the end by B, and since also F is detained endwise in A, the motions

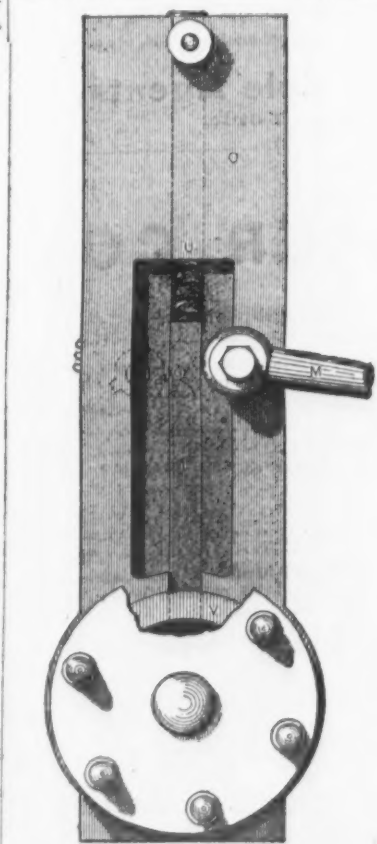


Fig. 7.—Operating Mechanism of the Turret. Top of Slide with Plate Removed.

reduction of motion between the hand-lever operating H and the motion of F is so great that with a very moderate force at the lever the wire may be held so that its projecting end may be twisted off without slipping the wire within the jaws or impairing the jaw grips. The cross slide is adjusted to fit in its guide-way by a jaw, S', Fig. 2, which is

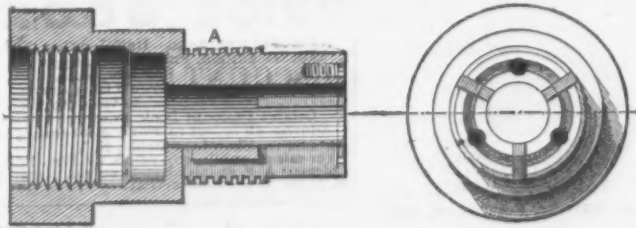


Fig. 4.—Detail of Chuck.

fastened in its adjusted position by tightening the nut. This is a very advantageous feature, and one which is not common in machines of this class. The rack and pinion is a much better device for transferring the lever motion than the link or sleeve and sliding end commonly employed, because it avoids the tendency to twist the slide in its guides, and

size calipers right. Nothing further is needed. The screw S has one collar, C, solid on it, and the screwed end is tapped into the sliding sleeve T, which is held from turning by the stud A. Between the solid collar C and the loose collar B there is a short, stiff spiral spring, as shown; by means of the fast and loose collars, the spring and the screwed



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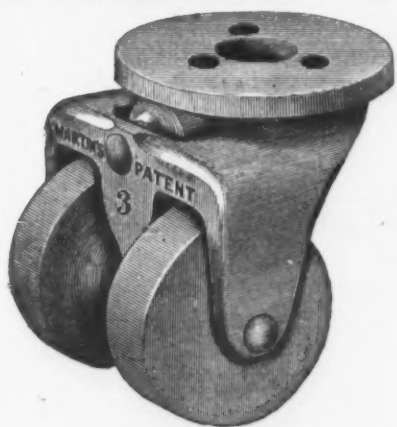
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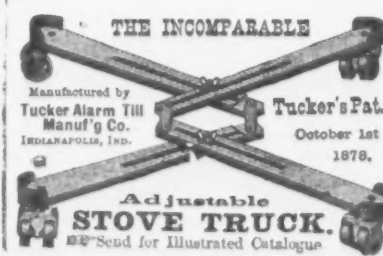
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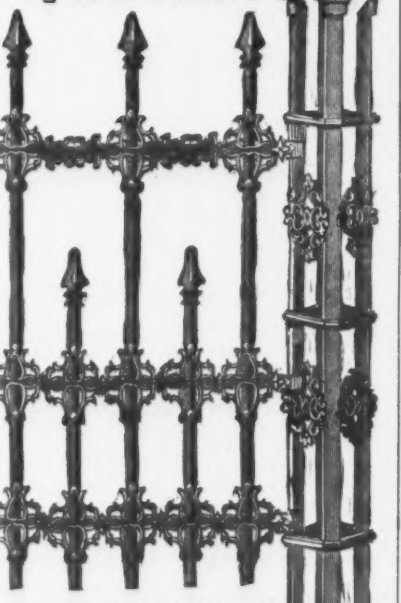
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seat in the disk V. This operation is completed before the motion of the segment brings the pin K in contact with the ratchet-wheel T. The segment in continuing its motion after the pin K is brought into the notch S, begins the revolution of the turret on its axis. As will be seen by the inspection of Fig. 8, the pin H works upon a much longer radius than the projection upon the cam with which it comes in contact, and therefore, after a given part of its motion is complete, gets beyond the reach of the cam, thereby releasing its hold and allowing the bolt L, Fig. 7, to be forced against the disk V by the expansion of the spring U, which occurs soon after the turret has commenced its revolution by the contact of pin K with the wheel T. The completion of the movement of the handle M (and the segment D) completes the revolution of the turret one-sixth of its circumference, thereby allowing the bolt L, by the further expansion of the spring U, to be forced into its next opening or seat in the disk V. The forward motion of the handle M brings the turret forward to its position at the work and restores the parts to their former positions, as shown in the illustrations. The adjustment of the tool height is effected by the threaded rings V and W, shown in Fig. 2. Small shelves are attached to the sides of the bed to hold tools, and a rack and pinion movement is employed in the cut-off slide, as well as on the turret slide. A new, simple, powerful and durable friction clutch is employed upon the counter-shaft, which is easily and silently reversed.

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#### New Power Stationary Bridge Crane.

We illustrate herewith a new type of crane, which for many purposes will prove very useful. It was constructed by the Yale Lock Manufacturing Company, of Stamford, Conn. The purpose of the crane, as will be readily seen, is to transfer loads from the ground, or from a car or other conveyance, to any floor of a building. All the operations of the crane are controlled (by means of two levers) by the operator, who is shown standing inside the lower door. The crane can be arranged so that the operator can stand in any convenient position. By means of the levers the operator can lift the load to any desired height, and cause it to traverse the bridge in either direction. Stops are provided so that it is impossible for the trolley to overrun in either direction on the bridge, or for the load to overrun either in hoisting or lowering. The crane, like all others manufactured by this company, holds the load at any point, and it cannot run down. This machine, for many purposes, therefore, combines the advantages of an elevator with a further advantage of being able to deposit the load at any point underneath the bridge. It will thus be practicable to use the machine on the inside of a building to lift through a hatchway, and then deposit the load at any point on the floor where the bridge might be. The machine illustrated is of a capacity of 10 tons, but of course any desired capacity can be furnished. Two changes of speed are provided, according as the load to be lifted is light or heavy.

#### Graduation.

Some general account of this subject, attention to which is directed at the present time by a controversy now in progress in our correspondence department, cannot fail to be of interest. Accordingly, we commence at this time the publication of a few short articles bearing upon it historically, as well as from a scientific standpoint. There will be found very little that is new in these articles, their very nature making that quite impossible, but we hope a new dress on old matter, much of which is gleaned from sources not generally accessible, will make it entertaining.

Graduation is the name given to the art of dividing straight scales, circular arcs, or whole circumferences into any required number of parts. It is the most important and difficult part of the work of the mathematical instrument maker, and is required in the construction of most physical, astronomical, nautical and surveying instruments, such as thermometer scales, linear measuring instruments, quadrants, sextants, mural circles, theodolites, &c.

The art was, undoubtedly, first practiced by clockmakers for cutting the teeth of their wheels at regular intervals; but, so long as it was confined to them, no particular delicacy or accurate nicety in its performance was required. This only arose when astronomy began to be seriously studied and the exact position of the heavenly bodies to be determined, which created the necessity for strictly accurate means of measuring linear and angular magnitude. Then graduation began to be looked upon as an art which required special talents and training, and hence we find that all the best astronomers have spent their best efforts on the perfecting of astronomical instruments. Of these may be named Sharp, Bird, Smeaton, Ramsden, the Duc de Chaulnes, John and Edward Troughton, Simms, and Ross.

It is obvious that the first graduated instrument must have been done by the hand and eye alone, whether it was in the form of a straight edge with equal divisions, or a screw, or a divided plate; but once in the possession of one such divided instrument, it was a comparatively easy matter to employ it as a standard and copy its divisions on any other article that might be desired. Hence graduation naturally divides itself into two distinct branches, original graduation and copying, which latter may be done either by the hand or by a machine called a dividing engine. We may thus speak of graduation under the three heads of original graduation, copying, and machine graduation.

Original graduation is by far the most difficult part of the art, so difficult, indeed, and requiring such accuracy of hand and eye that but few in a generation have been completely competent for the task. The earlier astronomers graduated their own instruments, and, from the examples that have come down to us, it must have been very roughly done as compared with modern work.

In regard to the graduation of straight scales, we have by elementary geometry the

means theoretically of dividing a straight line into any number of equal parts; but the practical carrying out of the geometrical construction is so beset with difficulties as to render the method untrustworthy. This method, which employs the common diagonal scale, was used in dividing a quadrant of 3 feet radius, which belonged to the Napier of Merchiston and which only read to minutes—a result, say Thomson and Tait (*Nat. Phil.*), "giving no greater accuracy than is now attainable by the pocket sextants of Troughton and Simms, the radius of whose arc is little more than an inch."

The original graduation of a straight line is, in practice, done either by the method of continual bisection or by stepping. In continual bisection the entire length of the line is first laid down. Then as nearly as possible half that distance is taken in the beam compass and marked off by faint arcs from each end of the line. Should these marks coincide, the exact middle point of the line is obtained. If not, as will almost always be the case, the distance between the marks is carefully bisected by the hand, with the aid of a magnifying glass. The same process is again applied to the halves thus obtained, and so on in succession, dividing the line into parts represented by 2, 4, 8, 16, &c., till the desired divisions are reached. In the method of stepping, the smallest division required is first taken, as accurately as possible, by spring dividers, and that distance is then laid off by successive steps from one end of the line. It is evident that in this method any error at starting will be multiplied at each division by the number of that division. Errors so made are easily adjusted by the dots being put either back or forward a little, by means of the dividing punch, guided by a magnifying glass. This is an extremely tedious process, as the dots, when so altered several times, are apt to get insufferably large and shapeless.

The division of circular arcs is essentially the same in principle as the graduation of

lines, aided by chords taken from an exact scale of equal parts which could read to .001 of an inch, and which he had previously graduated by continual bisections. With the beam compass an arc of radius 95.938 inches was first drawn. From this radius the chords of 30', 15', 10', 20', 4' 40' and 42' 40' were computed, and each of them, by means of the scale of equal parts, laid off on a separate beam compass to be ready. The radius laid off from 0 gave the point 60'; by the chord of 30' the arc of 60' was bisected; from the point 30' the radius laid off gave the point 90'; the chord of 15' laid off backward from 90' gave the point 75'; from 75' was laid off forward the chord of 10' 20', and from 90' was laid off backward the chord of 4' 40'; and these were found to coincide on the point 85' 20'. Now 85' 20' being  $5 \times 1704 = 5 \times 2^0$ , the final divisions of 85' 20' were found by continual bisections. For the remainder of the quadrant beyond 85' 20', containing 56 divisions of 5' each, the chord of 64 such divisions was laid off from the point 85' 40', and the corresponding arc divided by continual bisections, as before. There was thus a severe check upon the accuracy of the points already found, viz., 15', 30', 60', 75', 90', which, however, were found to coincide with the corresponding points obtained by continual bisections. The short lines through the dots were drawn in the way already mentioned.

The next eminent artists in original graduation are the brothers John and Edward Troughton. The former was the first to devise a means of graduating the quadrant by continual bisection, without the aid of such a scale of equal parts as was used by Bird. His method was as follows: The radius of the quadrant laid off from 0 gave the point 60'. This arc is bisected and the half laid off from 60' gave the point 90'. The arc between 60' and 90' bisected gave the point 82' 30', and the arc between the 82' 30' and 90' bisected gave the point 86' 15'. Further, the arc between 82' 30' and 86' 15' trisected and two-

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Charles H. Beebe, " " "

There were also present as guests Hon. David A. Welles, Mayor Osgood, of Norwich; Frederick L. Gardner, Charles E. Dyer, Henry W. Peabody, of Boston; Mr. Lusk, of Australia; D. D. Dana, Secretary Douglas A. Co.; C. B. Hill, Ameskeag Ax Co.; Isaac H. Bromley, New Haven; Alonzo H. Harris, Thos. D. Sayles, and others.

The company began to gather about noon, and was increased by welcome additions up to about two o'clock, when the members of the Lock Association assembled on the upper pavilion of the Club House for their monthly meeting. It was decided, almost without discussion, and certainly without dissent, that the conditions of business not only warranted but demanded a firm maintenance of prices, and the existing list was unanimously reaffirmed.

After the adjournment of the association, to meet a month hence at the Profile House, White Mountains, the company passed the time pleasantly at the card tables or in the bowling alleys until the welcome toot of the horn under the hill announced that the "Shore dinner," which had been awaited with hungry anticipation, was ready. The bill of fare was a memorandum of the

are entertained in many parts of the country as to the value and character of the exhibition will undoubtedly be fully realized. Both time and place fixed upon are well chosen for an undertaking of this kind, Denver being one of the largest cities of the plains, the most accessible of all in the State of Colorado, and the center of mining information and negotiations. Ample opportunity will be offered for the examination, in collective shape, of the wealth which has been discovered in the past few years, and all possible measures will be taken to impart interesting information in regard to the exhibits. Round trip tickets are to be sold from any point to Denver and return, including admission to the Exposition grounds, and the many valuable hints to be derived by visitors, combined with the pleasures of journeying through the mountains, will not fail to be appreciated. The Exposition building is a substantial structure, 500 feet long and 310 feet wide, and will contain, in addition to mineralogical specimens, all kinds of machinery and manufactures. The enterprise is headed by the most substantial and successful business men of Colorado, and bids fair to become, what it is intended to be, a national exposition whose yearly recurrence will be earnestly looked forward to throughout the entire country.

#### Nickel in Oregon.

At a recent meeting of the San Francisco Microscopic Society, the first public and reliable notice was made of the discovery of a large deposit of a rare form of nickel ore in Southern Oregon. The deposit is said to closely resemble that discovered in New Caledonia in 1864. According to a paper read before the University of Sydney by Professor Liversidge, these nickel minerals consist of two hydrated silicates of nickel and magnesia, which are found in small veins and fissures of serpentine occurring at Mont D'or, New Caledonia. They are found with chrome iron, stentite and other minerals only occurring in serpentine, and are seen disseminated through the loose blocks and boulders of that rock scattered over the surface of the ground. Dr. Hood has given the following analyses of the Oregon and New Caledonia nickel ores:

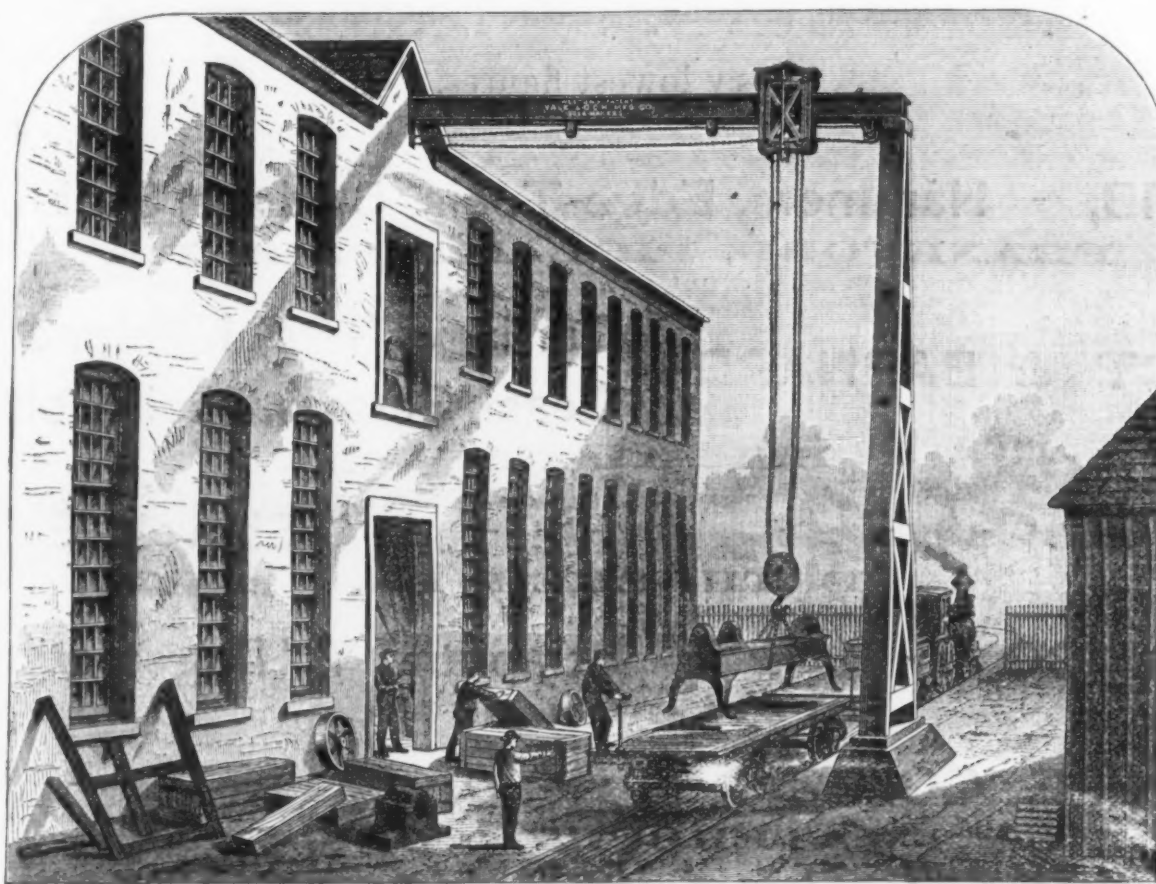
	Oregon Ore A	Oregon Ore B	Garnierite.	Noumele.
Silica.....	49.21	49.35	47.23	47.99
Iron & alumina oxide.....	1.38	1.13	1.66	3.00
Nickel oxide.....	23.68	20.66	24.01	24.99
Magnesia.....	19.90	21.70	21.66	12.51
Water.....	6.61	7.00	5.90	12.73

Amorphous—Hardness, 2.5; specific gravity, 2.45; adheres to tongue; not unctuous. Does not fall to pieces when placed in water.  
Amorphous—Hardness, 2.0-2.5; specific gravity, 2.20; color, dark apple green, becoming lighter by exposure. Adheres to tongue; unctuous. Falls to pieces when placed in water.  
Amorphous—Hardness, 2.0-2.5; specific gravity, 2.27; color, apple green. Adheres to tongue; not unctuous. Falls to pieces in water.  
Amorphous—Hardness, 2.5; specific gravity, 2.45; color, dark apple green. Does not adhere to tongue; unctuous. Does not fall to pieces in water.

The peculiarity of this deposit of nickel will undoubtedly be of considerable interest to mining engineers, and it is probable that works will be erected for its reduction at no distant time.

#### The Glass Industry of Pittsburgh.

The 75 glass factories of Pittsburgh and vicinity, 24 of which are devoted to the manufacture of window glass, 8 to flint bottles, 10 exclusively engaged in the manufacture of green glass bottles and 9 in the production of chimneys, [amply illustrate the manufacturing enterprise of this great Western industrial center. The factories are owned by 59 firms. The capital invested in them amounts to \$5,985,000, the number of hands employed is 6442 and the value of the product in 1881 was \$6,832,683. The growth of the glass chimney factories is very rapid, and may be traced directly to the development of petroleum in Pennsylvania. They furnish employment to 830 hands, and their extent is well exemplified by the following items of consumption: The material annually employed amounts to 350 tons of pearl ash, 500 tons of lead, 630 tons of soda ash and 3640 tons of sand. The greater number, in fact most all of the flint glass chimneys are made in Pittsburgh, the aggregate number turned out in a year exceeding 40,000. The factories devoted to the manufacture of the finer and more elegant products, such as crystal glass, give employment to about 1850 men, and consume annually 3300 tons of soda ash, 800 tons of nitrate of soda and 13,000 tons of sand. The articles turned out by these factories are not surpassed in looks, design or beauty by any other establishments of the kind within the United States. The extent of the window-glass trade of Pittsburgh may be readily imagined when it is stated that the product of one year required 720,000 packages or boxes, each of which contained 50 feet of glass, and a quarter of a million of houses are furnished every year with the Pittsburgh manufacture. The product of the bottle factories in a single year amounted to upward of 510,000 gross or 73,440,000 vials or bottles. Fifty-nine establishments are enumerated manufacturing window glass, flint or lime glass, green or bottle glass and pressed ware. Further comment on this subject is perhaps unnecessary, the figures given above amply illustrating the extent and growth of this most important industry, which among the different cities of the United States is so well represented in Pittsburgh.



New Power Stationary Bridge Crane, Built by the Yale Lock Manufacturing Company, Stamford, Conn.

straight lines, and of this we shall now give some examples. The first example of note is the 8-foot mural circle which was graduated by Graham for the National Observatory in 1725. In this, two eccentric arcs, of radii 60.85 and 95.8 inches respectively, were first described by the beam compass. On the inner of these the arc of 90' was to be divided into degrees and twelfth parts of a degree, while the same on the outer was to be divided into 96 equal parts and these again into sixteenth parts. The reason for adopting the latter was that 96 and 16 being both powers of 2, the divisions could be got by continual bisection alone, which in Graham's opinion, who first employed it, is the only accurate method, and would thus serve as a check upon the accuracy of the divisions of the outer arc. With the same distance on the beam compass as was used to describe the inner arc, laid off from 0, the point 60' was at once determined. With the points 0' and 60' as centers successively, and a distance on the beam compass very nearly bisecting the arc of 60', two slight marks were made on the arc; the distance between these marks was carefully divided by the hand, aided by a lens, and this gave the point 30'. The chord of 60' laid off from the point 30' gave the point 90', and the quadrant was now divided into three equal parts. Each of these parts was similarly bisected, and the resulting dimensions again trisected, giving 18 parts of 5' each. Each of these quinquesections gave degrees, the twelfth parts of which were arrived at by bisecting and trisecting as before. The outer arc was divided by continual bisection alone, and a table was constructed by which the readings of the one arc could be converted into those of the other. After the dots indicating the required divisions were obtained, either straight strokes all directed toward the center were drawn through them by the dividing knife, or sometimes small arcs were drawn through them by the beam compass, having its fixed point somewhere on the line which was a tangent to the quadrant arc, at a point where a division was to be marked.

The next important example of graduation was done by Bird in 1767. His quadrant, which was also 8 feet radius, was divided into degrees and twelfth parts of a degree. He employed the method of continual bisection, thirds of it taken beyond 82' 30', gave the point 85', while the arc between 85' and 86' 15' also trisected, and one third part laid off beyond 85', gave the point 85' 25'. Lastly, the arc between 85' and 85' 25' being quinquesectioned and four-fifths taken beyond 85', gave 85' 20', which, as before, is  $5 \times 2^0$ , and so can be finally divided by continual bisection.—*Mechanics*, July 29.

#### The Lock Makers in Council.

The United Association of Lock Manufacturers combined business with pleasure on Thursday last, in a way which all who had the good fortune to participate will have cause to remember with pleasure. At the invitation of the Norwich Lock Co., the July meeting was held at Kitemaug, a beautiful promontory on the Thames River, about midway between Norwich and New London. This place has been improved by the Kitemaug Association, a club of Norwich citizens and business men, incorporated in 1879. In this association no member can hold more than one share of stock, the par value of which is \$100, and only 150 shares can be issued under the present rules. The name of the promontory, Kitemaug, means place of crossing. The Mohegans and Pequots formerly occupied opposite sides of the river, and as this is the narrowest point for some miles, it was the natural point of intercommunication between the tribes. Remnants of these tribes still live in the neighborhood. The improvements at Kitemaug consist of a station on the railroad, an eighth of a mile back from the river, a pleasant club house on the top of the hill and a kitchen and dining room near the water. No liquors are purchased or dispensed by the club, but members who entertain their friends are at liberty to do so in their own way. The place is in all respects delightful, and is greatly enjoyed by the members. Mr. H. H. Osgood, mayor of Norwich, is president; Mr. F. L. Gardner, vice-president, and Mr. Chas. E. Dyer, secretary and treasurer. Mr. Sidney Turner and Chas. H. Beebe, of the Norwich Lock pany, members of the association, were hosts of the day. The following lock men were present:

"abundance of the sea," and for inland members and guests was a surprise and delight. Fish and clam chowder led, followed by baked blue fish, fritters and soft shell crabs; then came lobsters cooked in various ways, followed by bushels of clams, which were perfectly cooked and were to the steam-heated clams of Boston harbor and the "Cohogs" of Coney Island, as good wine to bad water. Some score of bushels were quickly disposed of, and each man gradually disappeared from the view of his neighbors behind a mountain of shells. It was an unequal contest, and when the clams had come up smiling for a last round, their assailants were lying back in their chairs exhausted and beaten. Indian pudding, watermelon and coffee concluded the feast. With the cigars, Mr. Turner rapped for order and called on some of the gentlemen present for appropriate remarks. Hon. David A. Welles made a very entertaining address, and read an unpublished poem by the late H. W. Longfellow, written for a clam bake, and probably his only venture in the line of humorous verse. Mr. Isaac H. Bromley made a very humorous speech, full of local reminiscences. As the time was short the speaking did not become general. In a few moments the Norwich boat came along and most of the party went aboard and were carried to that city, greatly enjoying the sail up the beautiful Thames. At Norwich the visitors were taken for a ride about the city, and were shown the many points of interest. It is a charming and interesting place—a city of comfortable houses and fine trees. About 8 o'clock the party assembled at the residence of Mr. Sidney Turner, whence they were conveyed to the boat train, leaving Norwich at 9.17 p. m. Every incident of the day had been delightful, and the Kitemaug meeting was voted a success.

**The Denver Exposition.**—The first annual National Mining and Industrial Exposition, which is to be held at Denver, commencing August 1st, promises to be one of the most interesting and important that has been held in the country since 1876. A complete collection of the various minerals, so abundant in our Western States, will probably form one of the principal features of interest, and the high expectations which



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### A New Direct Process.

The following translation of a report by Professor Särnström, on experiments made on dephosphorization in a charcoal furnace at Nyhammar, on the Vesterbergsliden, one of the largest iron deposits in Sweden, is given in *Iron*:

As is well known, bar iron was in earlier times produced from the ores by smelting with charcoal in small stoves or furnaces, and although the ores then used contained a considerable amount of phosphorus, this circumstance did not affect the mechanical properties of the metal, as most of the phosphorus was absorbed by this process in the slag. This process has been termed, by the Swedes, *Osmund*, and, by the Spaniards, *Catalan smelting*. Although excellent iron was produced by this method, it has, of course, given way to the blast and puddling furnaces. The reason of this is that in the old Swedish furnaces (in certain respects an improvement on the Spanish) the process was intermittent; it was necessary to heat and reheat them for any small quantity of iron charged, and to blow out and refill the shaft each time. It is evident that in this way a great deal of fuel was wasted, while but a very small quantity of iron was produced; and it may be supposed that the desire to improve the method gradually led to the now existing mode of making pig-iron, which, as a continuous process, naturally produces a larger quantity of metal, while a considerably smaller quantity of fuel is consumed. In the blast-furnace it became, however, necessary to make use of ores containing only a small quantity of phosphorus, and thus "mountain" or magnetic ores which contained percentages were objectionable.

contained percentages were objectionable. There is still, however, in certain parts of America a method in use by which ores containing a considerable quantity of phosphorus can be utilized. This method has been called "metal forging;" but as it is also intermittent, and takes place in open furnaces, it neither properly utilizes the fuel nor returns an equivalent percentage of iron, and has in consequence been found very costly, and therefore is in use only under exceptional circumstances. It is clear that, if the process of conversion takes place in a shaft, as in a blast furnace, without the temperature becoming so great as to effect any coalescence or complete smelting, and the mass is, at this stage, transferred in a convenient manner to a hearth where the further process of fusing the iron particles can take place, the process will at once become continuous and direct, and has the advantages of saving fuel and removing any impurities in the bloom at the same time. The furnace, during this operation, can be kept closed, so that reduction by the hot carbonic oxide proceeds continuously. The furnace at Nyhammar consists of a reduction shaft connected with the hearths by small culverts. These hearths can be closed, having vertical dampers with holes at their lower part, in order that the gases generated by the fuel may pass through the shaft and thus act the part of gas in an ordinary blast furnace. The dampers are balanced, and are therefore easily raised and lowered; the culverts being also furnished with single doors, by removing which the shaft can be repaired, the furnace can be done, but which, at the same time, close the furnace. Should it be desired to cut off the shaft from the remainder of the furnace, this can be done by a horizontal damper, which can be drawn closely over the hole. The operation of the furnace is as follows: Charcoal and ore are charged in the shaft in proper proportions, either by a special apparatus or in the common way. The ore will then, as it settles in the shaft, be subjected to the same process of conversion as in the ordinary reduction of a blast furnace. In order to transfer the spongy iron to another hearth, a hook is used, through the upper working holes in

passed through the upper working holes in the dampers of the culvert through which the operation of raking down is effected in order to keep the hearth always well filled with charcoal and iron until the smelting is nearly effected; but when it is desired to remove the mass of iron, the raking down is stopped, and the bloom allowed to go down in the hearth. It may then be easily broken up when one of the dampers is opened. During this operation one fire-place should be kept charged, as the gas pressure in the furnace should always be higher than the pressure of air from without, in order to prevent full suction of air through the open hearth. As soon as the bloom is removed and the hearth cleaned out, it is again closed and re-filled with charcoal and iron, by raking down from the shaft as before, and the blast turned on. In the same way, the process may be alternated with the other hearths. The furnace, which was erected at Nyhammar, consisted of a reduction shaft, 16 feet high, with a cubic diameter of 16 feet above and 18 below, made of fire-bricks, and was 1½ feet wide; it contained 302.4 cubic feet charcoal. With this was connected a hearth, the dimensions of which varied, as they were altered considerably during the progress of these experiments. The fittings were made of bar iron, and were very similar to those used in the Lancashire hearths. The dimensions were as follows: Distance between upper rim of tuyeres, 2 feet; but in order to facilitate the extraction of the bloom, they were made to slope an inch outward, being thus 2 inches less at the bottom. From the back, which was perpendicular, to the front wall, the distance was 2 feet, with 3 inches slope outward; but this distance may, perhaps, be somewhat reduced. The depth of the hearth was 1 foot, and the molds inserted an inch, with a declivity of about 22°, and their width at the nozzle ¾ by ¾ inch, with the upper sides semicircular.

As only one furnace was erected, it became necessary to have an additional "kolom," or heating apparatus, which was kept going to prevent any suction of air while the bloom was removed. In order not to obtain any metal before the tyures until the furnace was fully heated, about  $\frac{1}{2}$  cubic feet of charcoal were thrown into the hearth when the bloom had been removed. The front damper was then closed and charcoal and ore raked down from the shaft till the hearth became nearly filled; the blast was then put on and the raking down continued, according to appearances in the hearth. When the slag made its appearance before the tyures, generally half an hour after the blast had been opened, it was

tapped in precisely the same manner as in a Lancashire furnace. No particular work in the hearth was required, but when the tuyeres could not be kept free during the settling, it was found necessary to insert a bar carefully through one of the front dampers in order to ease the mass. This was, however, avoided as much as possible, as the coalescence of the materials was greatly accelerated by any stirring in the hearth, and caused great loss of iron in some instances. The smelting was also imperfectly effected, the bloom being irregular and covered with a slaggy coating. This was particularly the case when the action of the furnace was defective, owing to the choking of the tuyeres by unreduced ores, &c. When the mass commenced to fill the hearth, the slag became more heavy and porous, and poorer in iron; the raking down then ceased. The blast was still continued until the hearth became sufficiently empty to allow the breaking out of the bloom without removing any fuel. Towards the finish some work was done in the hearth with the bar, partly to keep the charcoal over the tuyeres, and partly to fettle up the bloom. This was, however, effected after opening one of the side doors. An advantage which is very considerable as regards the practical utility of this furnace is the great ease with which the raking down is effected, as well as any other operation which may be required in the hearth while the blast is on. For instance, when the furnace becomes heated, the flame, which is forced through the holes when these are opened, is so "cut" and transparent that it is quite possible to stand at a distance of 4 to 5 feet from the hearth and look into the furnace while raking down charcoal and ores without any inconvenience. With a little practice, which an unskilled laborer may acquire in a week's time, it is possible to charge and rake charcoal and ores uniformly down, an advantage of great importance, as it embodies a check whereby, to a certain extent, the action in the furnace may be kept perfectly even.

The furnace was tended by one man each shift, who, with the assistance of a boy, stored the ores and charcoal and also removed the slag and attended the "kolborn." As the hearth during the process was closed, the flame could only issue from the working hole through which the furnace was tended the heat was, therefore, small, and as the work consisted chiefly of raking down into the hearth, tapping the slag, and keeping the furnace clean, it may be said that the actual labor of tending the furnace was comparatively simple, both as regards the labor involved and the skill required. It may be added anybody without experience in tending furnaces can be employed, and one may, therefore, be entirely independent of the skilled workman, this circumstance being no inconsiderable factor in the method. The shaft was capable of holding from 22 to 23 charges of two barrels charcoal each, viz., 290 cubic feet each smelting, and one smelting was generally effected during 24 hours. In most of the experiments two barrels—12.6 cubic feet of charcoal to 3 cwt. of ore—were used, but toward the finish the quantity of ore was reduced to 2 cwt., i. e., to 1 cwt. per barrel of charcoal (6.3 cubic feet), and this proportion was found advantageous, both as regards ore and the quantity of fuel consumed, in proportion as the ores contain more or less phosphorus. It would, however, be better to keep the slag richer and more plentiful in iron by a greater charging of ore than otherwise, unless it should, of course, be preferred to make the process more basic by a flux of lime or alumina. If such should be the case, it may be pointed out that a flux of this kind would be more effective in effecting dephosphorization than a refining furnace, a result which is brought about by the ferrous oxide contained in the slag appearing to act on the phosphorus in the same manner as lime on sulphur.

The experiments above referred to were commenced in November, and continued till about the middle of December, and then resumed with few interruptions from January to March. The results arrived at during this period were, of course, variable, as the idea guiding these experiments was to find the best relation between the hearths, their diameter, the number of the tuyeres, their size, inclination, pressure of the blast, &c. The results here given will, therefore, be only such which tend to show what might best be effected with such a furnace, the following being the particulars of the working during the last few weeks. The ores used were unroasted iron ores from the Väfs förs mine in Gränges berg, a famous iron deposit in Sweden, and contained about 60 per cent. of iron, and 0.91 of phosphorus, which were charged with 1 cwt. of ore per barrel of charcoal, viz., 1 cwt. of ore to 6.3 cubic feet of charcoal. The results of the following five shifts were :

	Consumption of Charcoal, Barrels.	Ores, Cwt.	Yield of Iron, Cwt.
day shift.....	23	20	12.40
day shift.....	24½	22	11.60
day shift.....	7	6	4.00
night shift.....	25	22	10.65
day shift.....	21	18	10.80
	100½	—	—
	= 633 cubic ft.	88	48.45

As  $12\frac{1}{2}$  of these  $100\frac{1}{2}$  barrels were consumed in the fire-place, the actual quantity of fuel used for iron making was only 88 barrels, or 554.4 cubic feet for the smelting of some 88 cwt. of ores, the relative consumption being therefore 2.07 barrels, equal to 3.04 cubic feet charcoal and 1.80 cwt. ore per cwt. iron returned. The actual returns of iron were thus 55.05 per cent. It ought, however, to be stated that the bloom returned was not weighed separately, but in solid unbroken blocks, and although these, when broken up, were found extremely compact and free from slag, the result would, no doubt, not have been so satisfactory had the meltings been mixed together, just as they are from the hearths. The reason why this was not done was that they were at first too small and loose for the big hammer, and when they became larger and more compact, the Lancashire smiths did not approve of having their materials made impure by these. The only thing to be done was, therefore, to pile them up till a convenient opportunity arose of having them reheated in the Lancashire hearth, and to this end they were subsequently broken under the crushing hammer, when there was also a good opportunity of examining the fracture, which was

generally found somewhat coarse and crystalline, with a finer surface, however, underneath and at the edges, which could no doubt be accounted for by the circumstance that these parts had absorbed more carbon.

and these pits had absorbed more carbon than a rule three hours were required to smelt a mass of 3 to 4 cwt. It is, therefore, to be expected that the parts which were the longest exposed to contact with the charcoal had absorbed the greatest percentage of carbon, but with increased dimensions of the shaft a more thorough reduction, and therefore an increased production would be effected. The principal work of the furnace would also be to smelt the iron particles effectually, and the mass would not remain so long in the hearth, on one side exposed to carbon cementation, and on the other to the opposite effects of the slag and the blast, thus tending to make the bloom uneven. The effects of these are minimized in proportion, as less time is expended in the smelting, and a more homogeneous product may consequently be looked for. Owing to the depth of the hearth and the long time which was required for the settling, the bloom became cooled underneath, which made it a work of some difficulty to extract the slag at the notch. This difficulty ought to be avoided, either by heating the mass before it is taken out, or by giving it an appropriate heating in a separate furnace before breaking it up. Should it be desired to obtain a thoroughly homogeneous product by means of a melting process, the Martin furnace may be successfully employed. In consequence of the compactness and small carbon contents of the blooms, the process of refining in the Lancashire furnace was very slow. The loss was, therefore, in this case greater than would have been justified under any other circumstances.

The total quantity of iron made was about 300 cwt., from which the following analyses of the contents of phosphorus were made:

	Per cent.
Iron from Björnhytte mine.....	0.02
30 00 00 .....	0.06
30 00 00 .....	0.12
00 00 00 .....	0.10
00 00 00 .....	0.12
14 00 00 .....	0.08
14 00 00 .....	0.10

The two latter were, however, from blooms which were not remelted. In the crucible the Vafpols ore yielded 62.3 per cent. of pig iron, with 1.32 per cent of phosphorus. Three analyses of the iron gave respectively 1.33, 1.48, 1.70 per cent. of phosphorus, equivalent therefore to 3.04, 3.37, 4.10 per cent. phosphoric acid.

Under the tests made on the iron thus manufactured, in order to ascertain its tension, it did not show any tendency to red-shortness or brittleness; and by the experiments made at the testing establishment at Liljeholmen on a rolled bar of this iron, 600 lines long and 18 lines in diameter, the limit of elasticity was shown to be = 48 lb. per square line, with a bearing strain = 81 lb. per square line, with an elongation of 20.8 per cent., a result which, it must be admitted, is very satisfactory, and can compare well with the class of pig iron made by the Lancashire process. It was noticed in these experiments that the action in the hearth, and consequently the result, was in direct proportion to the temperature in the

heat proportion to the temperature in the shaft. If the furnace was sufficiently heated, no hard lumps could be noticed chafing the rod, when raking down, and the action was perfectly regular, the molds clear, and the formation of slag small; whereas, when this was not the case, the action became at once less satisfactory in proportion as the temperature in the shaft fell. As the temperature in a furnace can be lowered, not only by excessive charging, but also by an action which is either too quick or too slow, &c., the case was just the same in this instance, and the effect analogous, viz., the unreduced metal remains in the slag in the same proportion as the reducing capability of the furnace decreases; and as the iron in the hearth is not overcharged with carbon, besides appearing solid, no boiling could possibly arise from the influence of the iron-charged slag on the bloom; but this circumstance, in addition to the loss occasioned by unreduced iron being absorbed in the slag, should have caused further waste of metal. The question here, therefore, as with all furnaces, is to carefully observe that the charges, their quantity and composition, as well as other circumstances directly affecting the action of the furnace, are all in accord with the object in view, although it may be said that divergences may in the present method not affect the action of this furnace to the extent which is the case with an ordinary blast-furnace from the same causes. At the same time it seems from the practical experiences gained from this method that any overcharging of the shaft has an injurious effect on the smelting. Experiments were also made at Lödöfors with the same method. The shaft was in this case 16 feet high, and capable of containing ten charges of two barrels, viz., 12.6 cubic feet, each, about half the quantity, therefore, of the one erected at Nyhammar. The manufacture here was 16 cwt. pig-iron per shift, with a consumption of 25.2 cubic feet charcoal per cwt. pig, and about  $\frac{1}{4}$  cwt. ore per barrel of charcoal = 6.3 cubic feet. By the experiences thus gained in this method, it seems—while, of course, pointing out the improvements and alterations which might be effected for its simplification—that it could be of practical utility as a charcoal process for the direct conversion of ores containing an unusually large amount of phosphorus.

It is to be regretted that the ore found in the district of Vesterbergeladen, unequal in quality to the best in Sweden, is not equal in quality to the generally found ore of that country. It contains about upon 70 per cent. of pure iron, but as much as 1 to 50 per cent. of phosphorus, which, with the means at present at disposal, renders them of little use for the manufacture of steel. The metal from these ores is, however, largely used for castings, and if the time be not far distant when the charcoal supply of Sweden may fail to satisfy the demand, and coals be required for smelting, the deposit may become a source of immense wealth to that country. Among the extensive iron deposits in this district, the above-mentioned Rängsberg alone contains a bed of iron said to be nearly 15,000 feet long and 1000 to 2000 feet wide, consisting partly of peroxide

of iron and partly of magnetic iron of volcanic origin, the gangue being quartz and apatite.

The Alexandrowsky Steel Works,  
Russia.

The "Foreign Abstracts of the Institution of Civil Engineers," England, contain an interesting article on the Alexandrowsky Steel Works, near St. Petersburg, Russia, translated from the *Jernkontorets Annaler*. The works were commenced at the end of 1877, set to work in March, 1879, and since that time have been in continuous operation. The products are steel rails for the government lines, and projectiles and guns of cast steel, these latter being made according to the *Terre-Noire* process. The plant comprises seven melting and six preparatory heating furnaces on the Siemens-Martin principle, which are arranged in a single line about 350 feet long; the heating and melting furnaces alternate with each other. Six of the melting furnaces are of seven tons capacity, while the seventh takes a nine-ton charge. The latter is a little over 3 feet larger than the smaller ones, and has two openings instead of only one on the working side. The gas producers are placed in a line parallel to the furnaces, there being four to a melting and three to a heating furnace, and each pair of furnaces has its own chimney. The capacity of the four regenerator chambers under each melting furnace is 1559 cubic feet, and as the consumption of coal is about nine tons daily per furnace, the capacity per ton of coal per day is about 170 cubic feet. The hearth bottom of the melting furnaces, which are carried upon 2-inch cast-iron plates, are made of a lower layer of Dinas bricks  $2\frac{1}{2}$  inches, covered by 4 inches of a mass formed of 42.5 per cent. of clean sand from Lake Ladoga, 42.5 per cent. of burnt quartz and 15 per cent. of Russian fire-clay; the sides and roof are of Dinas bricks. The average working life of the furnace is 232 charges, the highest attained being 280. The roof requires partial renewal after about 150 charges. About 10 days are required for the complete renewal of the hearth and walls of the furnace. The ingot molds are carried on a turn-table, so that each one may be brought in succession under the tap-hole of the furnace, no ladle being used. They are lifted and removed by a transportable steam-crane running on a line of railway parallel to the longitudinal axis of the furnaces.

The materials chiefly used up to 1881 were: English hematite pig, averaging 3 per cent. of carbon, 1.0 per cent. of silicon, .035 per cent. of sulphur, and .078 per cent. of phosphorus; good Bessemer scrap from England and France; broken rails and other scrap produced in the works; worn out rails from Russian railways, with about 3 per cent. of phosphorus; Swedish spiegel from Schisthyttan, with from 3 to 15 per cent. of manganese; ferro-manganese from Terre-Noire, with from 60 to 80 per cent. of manganese; silica ferro-manganese from Terre-Noire, with from 4 to 10 per cent. of silicon, and rich pure iron ore from Sweden:

Good English coal is used in the producers. Originally the charges were as follows :

Pig iron.....	20
Steel scrap.....	37
Iron rails.....	40
Ferromanganese.....	3

The finished rails contained 0.15-0.20 per cent. of phosphorus, carbon 0.25 per cent., and manganese 0.45 per cent. As rails of this composition would not stand the extreme cold of the Russian winter, the proportion of iron rails and pig metal was reduced, that of steel scrap being correspondingly increased, having per charge:

giving a product with a 0.08-0.10 per cent. of phosphorus, 0.3-0.4 per cent. of carbon, 0.8-0.9 per cent. of manganese, and only traces of silicon. At present the average amount of pig used is about 20 per cent. The details of eight successive charges, both in the larger and smaller furnaces, are set forth in tabular form by the author.

In the smaller furnace the average time of working a 7-ton charge is 6½ hours, of which 1 hour and 25 minutes are required for rearing the furnace, tapping, heating up and charging. The time required for filling the pigot molds is from 10 to 12 minutes. The yield from a 7-ton charge is from 13 to 14 pigots, each of the weight of two rails, of

From 1150 to 2000 pounds. The ore reduction process was tried experimentally with charges containing 36 per cent of pig metal, and 8 per cent. of a somewhat quartzose Swedish iron, containing 55 per cent. of iron, which was added to the bath in quantities of about 2640 pounds at intervals of about 10 minutes, being first brought to a dull red heat in the heating furnace. The total amount of ore added was about 1100 pounds. It was found, however, from its low specific gravity, that it was difficult to incorporate with the bath, and, floating on the surface, it was mostly taken up by the slag, which consequently became very basic, and corroded the furnaces to such an extent that, after making 15 charges, the use of ore had to be abandoned. The ingots for analysis are taken direct to a Bicheroux heating furnace with a bed 27 feet long, and about 5 feet broad, which is capable of reheating 140 ingots, weighing 75 tons, per day, with a consumption of coal varying from 11 to 13 per cent. of the weight of the work heated, according as the latter is charged warm or cold. The heated ingots are passed 10 times

rough a double cogging mill, which reduces the thickness from about 10 to 8 inches, and are then reheated in a Siemens furnace and rolled out to finished rails by 13 passes through the rail mill. Both mills are worked by the same engine, which has three horizontal direct-acting cylinders and is 1200-horse power. The greatest amount of work in one day has been 585 rails, or about 40 tons. These vary in length from 24 to 38 feet, and weigh from 550 to 670 pounds. In testing the finished work, three rails out of every thousand are taken and cut into three parts. One part of each is subjected

to a bending test by loading it with 17.25 tons midway between bearings 3.2 feet apart. The load must be carried for five minutes without producing a deflection greater than .12 inch, or a permanent set of more than .08 inch. The other two parts of the same rail are cooled in a mixture of iron and salt to 18° C., when they must resist, without breaking, two blows from a weight of somewhat over 1000 pounds, falling 8 feet, the rails resting on supports about 3 feet apart. If three out of the nine samples fail in these tests, the whole batch is rejected.

The charges for projectiles consist of about 67 per cent. of Bessemer and other steel scrap, 5.4 per cent. of pig iron, 11.4 per cent. of spiegel and ferromanganese, and 0.1 per cent. of silicon manganese alloy. The metal is cast in chills and the projectiles are oil-tempered, about 20 per cent. being broken in the process. Lately the increased customs duty has prevented the use of good foreign scrap and pig iron, and an attempt has been made to adopt the basic process for inferior material. The following changes have been tried:

	Per cent.
Iron ore.....	6.7
Lime.....	6.7
Overland pig.....	25.0
Old ingot molds.....	4.5
Scrap.....	44.5
Hematite pig.....	6.7
Spiegel.....	5.4
Ferro-manganese.....	9.0

**Total.** . . . . . The iron ore was a quartzose specular iron from Stripa, in Sweden, containing about 43 per cent. The Cleveland pig contained 1.61 per cent. of phosphorus; the broken ingots, 0.7; and the scrap, 0.3 per cent. The furnace bottom was covered with a mixture of dolomite and coal tar, which burns to a very hard mass. About two-thirds of the lime and iron ore were first charged with the pig iron and a part of the scrap; the remainder of the former and the latter followed at short intervals. When a test of the metal, after hammering and cooling in water, can be bent double without breaking, the hematite pig is added, and when it is completely incorporated, and a fresh test is capable of bearing from five to eight blows of a 20-pound sledge, the spiegel and ferro-manganese are added. Care must be taken before each addition to the charge to remove the highly phosphoretted slag. The finished ingots contain only 0.06 per cent. of phosphorus.

## SCIENTIFIC AND TECHNICAL

### A NEW WATER METER.

A new apparatus for measuring the consumption of water has recently been introduced, and consists of two cast-iron cylinders inclined to each other at an angle of about 26°. These cylinders are supported on a pivot, and are free to rock from side to side as the weight of water in the one or the other causes it to move. The cylinders are connected with each other at the bottom, and are partly filled with mercury. Inlets and outlets for water are controlled by the oscillating motion, which, moreover, serves to move the registering device which marks the quantity of water which passes through the apparatus. The water on entering one cylinder drives out the mercury, which passes over to the other cylinder; the weight of the other cylinder is thus increased and descends, its movement on the pivot opening the outlet port and closing the inlet port. At the same time the second inlet port is opened and the water flows into the second cylinder, thus securing a continuous passage of the water, while the oscillation of the cylinder controls the registering apparatus.

### EXPANSION OF METALS ON SOLIDIFICATION.

An interesting series of experiments are reported to have been made by Messrs. Nies and Winkelman on the changes in volume of a number of metals on cooling from fusion. Of the eight metals (tin, lead, zinc, bismuth, cadmium, antimony, iron and copper) submitted to investigation, six—namely, tin, zinc, bismuth, antimony, iron and copper—expanded at the moment of solidification, so that the solid is less dense than the liquid metal. The results obtained with the remaining two metals were not decided, though it is believed that they also expand on solidification.

## ARTIFICIAL MARBLE.

Mr. E. O'Neill, of London, England, proposes to manufacture slabs or other forms of material in imitation of marble or any artificial stone by a mixture of approximately equal weights of Portland cement, blue lias cement, cinder or coke dust and marble dust with water, containing in solution about 1 per cent. of borax. The mixture should be of a pasty consistency, and is run into molds in order to get it into the desired shapes. After having remained in such molds about 4 hours, or until it is thoroughly set, the casts are removed, dried, and carefully smoothed by rubbing the surfaces that are to be enameled with sandpaper. For enameling, he applies a succession of coats of varnish, preferably in the following order: 1. The best tar varnish. 2. Pontypool varnish. 3. A mixing varnish. 4. Copal varnish; and 5. Fine polishing varnish. After the application of each coat the cast is baked for about 24 hours in an oven at a temperature of from 150 to 200° F., and is then rubbed with pumice-stone as usual to remove all roughness. After the final baking and rubbing the surfaces are polished with rotten stone until a brilliant polish is attained. The desired colors are applied along with some of the coats of varnish, the ground color being applied preferably before the first coat of varnish, and the veins or streaks being applied between some of the succeeding coats.

THE PROPORTION OF CARBONIC ACID IN THE  
UPPER REGIONS OF THE ATMOSPHERE.

Messrs. Muntz & Aulhin have recently made a number of very carefully-conducted determinations of the amount of carbonic acid contained in the air, which was collected at the summit of the Pic du Midi, a peak of the Pyrenees, a little over 9000 feet high. The average of their results gave 2.86 plumes in 10,000, a quantity corresponding very closely to that obtained on the plain of France. It would appear from these results that the gas is very uniformly distributed in the atmosphere, a view which confirms that of several other investigators of the subject.







export.....	9,083	48,408
.....	2,982,943	\$12,806,912
ual to ..... tons	149,147	

Lead.—The market has been inactive, so as large lots are concerned, while in a



small way Common Lead continues to bring \$5.10 @ \$5.15. Larger consumers are stocked for the present. At the close the market may be called 5 1/2¢. As for Refined, correctors, for the moment, buy only from hand to mouth, but during the current month one or the other will have to re-enter the market. We quote: Refined, \$5.15 @ \$5.20, nominally; it would, indeed, not be easy to get \$5.15 just at present. As Common Lead can be laid down here from Europe at \$5.15 @ \$5.17 1/2, importation might be thought of should the market here stiffen up again, but the apprehension of a sudden drop here paralyzes action in this direction. European Lead production last year is put down at the following figures: Spain, 120,000 tons; Germany, 90,000; England, 67,000; France, 15,000; Italy, 10,000; Greece, 9,000; Belgium, 8,000; Austria, 6,000; Russia, 1,500; total, 326,500. Adding thereto the output in this country of something like 110,000 tons, a total between Europe and America, including Mexico, Canada and South America, would be arrived at of 440,000 tons, which is probably correct. At St. Louis Soft is worth \$4.80 @ \$4.85, and Hard, \$4.75, with 3¢ freight this way. Manufacturers have been subject to no change since our last. We quote: Pipe, 7 1/2¢; Sheet, 8¢; Tinned Pipe, 15¢; and Block 45¢; all less 10% to the trade. We receive from London the cable news below: "Prices steady and demand light. Common English Pig, £14 7/6 @ £14 10/."

**Spelter and Zinc.**—Although the feeling has been reported to be an improving one in Europe, the demand here lessened the moment more Spelter was offered, so that it would not be easy to get over 5 1/2¢ @ 5 3/4¢ for Domestic to-day, nor over 5 1/2¢ for Silesian. Spelter production, was per capita from our Italian exchanges, was last year 99,405 tons in Germany (which includes 65,439 in Silesia), 85,000 in Belgium, 22,000 in England, 13,715 in France, and 3,200 in Austria; together, 223,320 tons. We quote: Bertha Refined, 8¢, and Bergenport, 9 1/2¢. From London we are cabled as under: "Market quiet and business fair; prices firmer. Ordinary, at shipping ports, £17 @ £18. 2/6." Sheet Zinc.—There is not much doing at 7 1/2¢ @ 7 3/4¢.

**Antimony.**—A fair jobbing trade has been transacted during the week, at 11 1/2¢ @ 11 3/4¢ for Hallett, and 13 1/4¢ @ 13 1/2¢ for Cookson.

#### OLD METALS, PAPER STOCK, &c.

The purchasing prices offered by dealers are as follows:

	1880.	1881.	1882.
Copper, heavy.....	10 1/2	10 1/2	10 1/2
" light.....	10 1/4	10 1/4	10 1/4
Copper Bottoms.....	10 1/4	10 1/4	10 1/4
Yellow Metal.....	10 1/4	10 1/4	10 1/4
Brass, heavy.....	10 1/4	10 1/4	10 1/4
Brass, light.....	10 1/4	10 1/4	10 1/4
Composition, heavy.....	10 1/4	10 1/4	10 1/4
Lead, heavy.....	10 1/4	10 1/4	10 1/4
Tea Lead.....	10 1/4	10 1/4	10 1/4
Zinc.....	10 1/4	10 1/4	10 1/4
Pewter, No. 1.....	10 1/4	10 1/4	10 1/4
Pewter, No. 2.....	10 1/4	10 1/4	10 1/4
Wrought Iron.....	10 1/4	10 1/4	10 1/4
Light do.....	10 1/4	10 1/4	10 1/4
Stove Plate.....	10 1/4	10 1/4	10 1/4
Machinery do.....	10 1/4	10 1/4	10 1/4
Grate Bars.....	10 1/4	10 1/4	10 1/4
Electrotype plates.....	10 1/4	10 1/4	10 1/4
Stereotype plates.....	10 1/4	10 1/4	10 1/4
Small type.....	10 1/4	10 1/4	10 1/4

The prices current (prices paid by local dealers) for Rags, &c., are as follows:

	1880.	1881.	1882.
Canvas, Linen.....	10 1/4	10 1/4	10 1/4
White Cotton, New.....	10 1/4	10 1/4	10 1/4
" No. 2.....	10 1/4	10 1/4	10 1/4
White, No. 1.....	10 1/4	10 1/4	10 1/4
" No. 2.....	10 1/4	10 1/4	10 1/4
Seconds.....	10 1/4	10 1/4	10 1/4
Soft Woollens.....	10 1/4	10 1/4	10 1/4
Mixed Rags.....	10 1/4	10 1/4	10 1/4
Gunny Bagging.....	10 1/4	10 1/4	10 1/4
Jute Butts.....	10 1/4	10 1/4	10 1/4
Kentucky Bagging.....	10 1/4	10 1/4	10 1/4
Book Stock.....	10 1/4	10 1/4	10 1/4
Newspapers.....	10 1/4	10 1/4	10 1/4
Waste Paper and Scraps.....	10 1/4	10 1/4	10 1/4
Kentucky Bale Rope.....	10 1/4	10 1/4	10 1/4

#### FOREIGN TRADE MOVEMENTS.

The following is a summary of foreign trade movements during the past week:

	1880.	1881.	1882.
Total.....	\$1,681,583	\$1,589,041	\$1,738,478
Prev. reported.....	\$1,693,314	\$1,545,583	\$1,600,791
Since Jan. 1.....	\$203,592,896	\$246,824,664	\$294,539,269

Included in the imports were articles of merchandise valued as follows:

	Quantity.	Value.
Antimony.....	68	4,574
Arabic.....	415	\$1,507
Antimony ore.....	30	683
Brass goods.....	35	4,650
Bismuth.....	2	939
Bronzes.....	10	1,491
Chains and anchors.....	68	4,007
Clocks.....	66	9,020
Copper.....	313	3,130
Cutlery.....	197	42,707
Gas fixtures.....	1	592
Guns.....	282	38,225
Hardware.....	35	1,246
Iron, pig, tons.....	6,287	126,548
Iron, sheet, tons.....	52	2,893
R. R. bars.....	2,409	24,423
Iron ore, tons.....	5,974	71,390
Iron, other, tons.....	1,099	39,280
Lead, pigs.....	1,237	5,102
Machinery.....	267	34,876
Metal goods.....	271	2,265
Nails.....	36	6,001
Needles.....	16	6,280
Nickel.....	27	6,675
Old metal.....	517	2,452
Platina.....	3	2,452
Plated ware.....	2	50
Percussion caps.....	3	677
Pins.....	17	2,413
Quicksilver.....	353	7,265
Railroad.....	22	4,362
Steel.....	45,020	118,325
Steel pens.....	6	4,021
Steel blooms.....	172	18,187
Spelter, lbs.....	16,525	16,525
Silverware.....	9	2,248
Tin, bars.....	71,158	71,158
Tin, slabs, 500 lbs.....	50,703	13,151
Wire.....	439	5,608
Zinc, lbs.....	83,206	3,593

The quantity of leading articles compares with previous dates as follows:

	For the week.	30 weeks.	Same time.
Cutlery, pkgs.....	107	4,314	4,064
Hardware, pkgs.....	25	620	631
Iron, R. R. bars.....	2,409	76,800	230,094
Lead, pigs.....	1,237	18,675	24,738
Steel, pkgs.....	45,020	1,204,626	877,601
Tin, boxes.....	71,158	1,338,148	878,340
Tin slabs, lbs.....	50,703	9,080,110	8,968,988

#### EXPORTS OF SPECIAL.

	For the week ended July 29:
Total.....	\$1,729,478
Previously reported.....	\$1,841,500
Total since January 1, 1882.....	40,577,728
Same time in 1881.....	6,787,208
Same time in 1880.....	5,082,378
Same time in 1879.....	11,620,098
Same time in 1878.....	9,100,032
Same time in 1877.....	21,109,819
Same time in 1876.....	38,201,322
Same time in 1875.....	61,036,004
Same time in 1874.....	36,076,609
Same time in 1873.....	38,216,788
Same time in 1872.....	54,801,039

#### EXPORTS EXCLUSIVE OF SPECIAL.

	1880.	1881.	1882.
Total.....	\$8,628,199	\$7,372,229	\$6,900,443
Prev. reported.....	\$8,603,632	\$7,372,229	\$6,900,443
Since Jan. 1.....	\$233,493,831	\$221,016,081	\$187,844,278

#### IMPORTS

##### Of Hardware, Iron, Steel and Metals (into the Port of New York, for the Week ending August 2, 1882:

	1880.	1881.	1882.
Hardware.....	2,409	76,800	230,094
Armstrong & Co.....	2,409	76,800	230,094
Baker Hermann & Co.....	2,409	76,800	230,094
Bloomfield J. C. & Co.....	2,409	76,800	230,094
Brown Wm.....	2,409	76,800	230,094
Carter W. C.....	2,409	76,800	230,094
Cooper, Jones & Cadbury.....	2,409	76,800	230,094
Downing, Sheldon & Co.....	2,409	76,800	230,094
Folsom H. & D.....	2,409	76,800	230,094
Field Alford & Co.....	2,409	76,800	230,094
Godfrey C.....	2,409	76,800	230,094
Graef Cutlery Co.....	2,409	76,800	230,094
Hartley, Graham & Co.....	2,409	76,800	230,094
Hildick A. H.....	2,409	76,800	230,094
Isaacs, Vought & Co.....	2,409	76,800	230,094
Kernkamp Th.....	2,409	76,800	230,094
King Henry.....	2,409	76,800	230,094
Latham, Alexander & Co.....	2,409	76,800	230,094
Merchandise Dis. Co.....	2,409	76,800	230,094
Morris L. W.....	2,409	76,800	230,094
Moore's Sons J. P.....	2,409	76,800	230,094
Nat. Mfg. Co.....	2,409	76,800	230,094
Pratt & Farmer.....	2,409	76,800	230,094
Read, Holliday & Co.....	2,409	76,800	230,094
Rosenstein Bros.....	2,409	76,800	230,094
Schuyler & Duane.....	2,409	76,800	230,094
Schoverling, Daly & Co.....	2,409	76,800	230,094
Squire H. C.....	2,409	76,800	230,094
Struller, Lau & Co.....	2,409	76,800	230,094
Sussfeld, Lorch & Nordlinger.....	2,409	76,800	230,094
Spellman W. B.....	2,409	76,800	230,094
The Kennedy Tobacco Co.....	2,409	76,800	230,094
Von Cleff.....	2,409	76,800	230,094
Winchester Arms Co.....	2,409	76,800	230,094
Ward Albion.....	2,409	76,800	230,094
Wolf Maria.....	2,409	76,800	230,094
Witte John G. & Bro.....	2,409	76,800	230,094
Wiebusch, Hilger & Co.....	2,409	76,800	230,094
Wells, Fargo & Co.....	2,409	76,800	230,094
Order.....	2,409	76,800	230,094
Rivets, cs, 4.....	2,409	76,800	230,094
Boxes, 7.....	2,409	76,800	230,094
Iron.....	2,409	76,800	230,094
Baker Hermann & Co.....	2,409	76,800	230,094
Chains, cs, 74.....	2,409	76,800	230,094
Baring Bros. & Co.....	2,409	76,800	230,094
Finished bars, 7146.....	2,409	76,800	230,094
Bond, Parsons & Co.....	2,409	76,800	230,094
Bohn, Mayer & Co.....	2,409	76,800	230,094
Coddington T. B.....	2,409	76,800	230,094
Carey & Moen.....	2,409	76,800	230,094
Wire rods, bbls, 456.....	2,409	76,800	230,094
Sheet, bbls, 59.....	2,409	76,800	230,094
Crocker Bros.....	2,409	76,800	230,094
Pig, tons, 1038.....	2,409	76,800	230,094
Gibb.....	2,409	76,800	230,094
Old rails, lot, 1.....	2,409	76,800	230,094
Gilbert & Co.....	2,409	76,800	230,094
Hayward, Perry & Co.....	2,409	76,800	230,094
Frederick.....	2,409	76,800	230,094
Bars, 1200.....	2,409	76,800	230,094
Hill Edward.....	2,409	76,800	230,094
Oxide, cs, 15.....	2,409	76,800	230,094
Irwin Richard & Co.....	2,409	76,800	230,094
Pig, tons, 200.....	2,409	76,800	230,094
Iron clad Mfg. Co.....	2,409	76,800	230,094
Blanks, cs, 401.....	2,409	76,800	230,094
Blanks, bales, 102.....	2,409	76,800	230,094
Scrap, cs, 1.....	2,409	76,800	230,094
Kaoblanck & Lichtenstein.....	2,409	76,800	230,094
Wire rods, bbls, 1771.....	2,409	76,800	230,094
Lalanc & Grosjean.....	2,409	76,800	230,094
Bundles, 458.....	2,409	76,800	230,094
Lee Jas. & Co.....	2,409	76,800	230,094
Pig, tons, 700.....	2,409	76,800	230,094
Lundberg Gust.....	2,409	76,800	230,094
Bars, 1027.....	2,409	76,800	230,094
Bundles, 1187.....	2,409	76,800	230,094
Marvel W. D.....	2,409	76,800	230,094
Ore, tons, 300.....	2,409	76,800	230,094
Mason John W. & Co.....	2,409	76,800	230,094
Pig, tons, 25.....	2,409	76,800	230,094
McCor & Sanders.....	2,409	76,800	230,094
Sheet iron, bbls, 223.....	2,409	76,800	230,094
Moors J. B. & Co.....	2,409	76,800	230,094
Pig, tons, 25.....	2,409	76,800	230,094
Morton, Bliss & Co.....	2,409	76,800	230,094
Rails, cs, 94.....	2,409	76,800	230,094
N. Y. Nat. Bk. Assn.....	2,409	76,800	230,094
Hoops, bbls, 10,200.....	2,409	76,800	230,094

#### EXPORTS

##### Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the Week ending August 1, 1882:

At iron, pgs.	25	856
Hdw., pkgs.	9	126
Mach'y, pkgs.	35	322
Ag. imp, pkgs.	0	241
Ptm., gals.	225,677	37,000
Sew. ma., cs.	30	365
Clocks, bxs.	29	806
Pumps, pkgs.	3	150
<b>Bremen.</b>		
Pumps, pkgs.	5	226
Ag. imp, pkgs.	3	136
Hdw., pkgs.	4	3,510
Ptm., gals.	225,677	37,000
Hdw., pgs.	230	25,125
Met. packing, case.	1	274
<b>Stockholm.</b>		
Ptm., gals.	204,400	15,000
<b>Stettin.</b>		
Ptm., gals.	196,967	14,500
<b>Rotterdam.</b>		
Pumps, pkgs.	8	523
Main, pkgs.	1	50
W. mills, cs.	4	305
Mach'y, pkgs.	7	145
<b>Amsterdam.</b>		
Mf. iron, pgs.	3	50
Ptm., gals.	15,000	1,727
Ag. imp, pkgs.	7	226
Ag. imp, pkgs.	7	226
Clocks, pkgs.	7	178
<b>Antwerp.</b>		
Ptm., gals.	250,015	24,125
Swords, bxs.	9	150
Clocks, box.	0	132
Guns, case.	1	49
Hdw., pkgs.	75	727
<b>Dutch East Indies.</b>		
Ptm., gals.	965,110	106,903
<b>Norwegian, Sweden.</b>		
Ptm., gals.	440,400	3,000
Naph, gals.	18,750	1,200
<b>Elisnor.</b>		
Ptm., gals.	224,267	15,500
<b>Hull.</b>		
Ag. imp, pgs.	8	561
Mach'y, pkgs.	3	50
Hdw., pgs.	110	2,671
Clocks, pkgs.	3	468
<b>Liverpool.</b>		
Clocks, bxs.	41	1,950
Hdw., pkgs.	66	540
Pumps, pkgs.	1	30
Mf. iron, pgs.	2	50
Revol., cs.	1	4,500
Sew. ma., cs.	75	1,224
Mf. iron, pgs.	127	2,520
Mach'y, pkgs.	7	225
Clocks, pkgs.	11	305
Nails, bxs.	1,684	1,684
Stumpware, cs.	16	149
<b>Ermouth.</b>		
Naph, gals.	106,200	6,600
Ptm., gals.	175,000	1,800
<b>London.</b>		
Sew. ma., cs.	144,210	10,203
Ptm., gals.	154,250	15,750
Rev., cs.	1	4,500
Car wheels.	100	630
Hdw., pkgs.	73	1,370
Windmills.	17	787
Mach'y, pkgs.	16	1,495
Clocks, pkgs.	138	3,032
Ptm., gals.	773,570	62,154
Pumps, pkgs.	10	305
Valves, cs.	35	1,563
<b>British Possessions in Africa.</b>		
Nails, keg.	65	415
Clocks, pkgs.	1	36
Mach'y, pgs.	3	46
W. mills, cs.	1	90
Cartridges, cs.	26	194
Rev., cs.	103	4,500
Rif., cs.	370	8,088
Ag. imp, pkgs.	370	8,088
Hdw., pkgs.	804	9,082
Sew. ma., cs.	3	45
Pumps, pkgs.	10	315
Ptm., gals.	68,090	11,515
Rifles, cs.	1	27
Gr. insts, cs.	8	641
If. iron, pkgs.	131	850
<b>British East Indies.</b>		
Ptm., gals.	525,000	37,750
<b>New Zealand.</b>		
Hdw., pgs.	892	15,225
Ag. imp, pgs.	351	9,272
If. iron, pkgs.	590	6,107
Umps, pkgs.	15	691
Clocks, bxs.	31	595
Ptm., gals.	180	140
Nails, keg.	38	140
Clocks, cs.	3	38
Mach'y, pkgs.	10	2,174
Nails, pkgs.	69	343
Rif., cs.	18	140
Sew. ma., cs.	11	210
Saws, cs.	6	305
<b>Cette.</b>		
Ptm., gals.	271,210	10,177
<b>Rouen.</b>		
Ptm., gals.	295,446	20,754
<b>British West Indies.</b>		
Ptm., gals.	21,705	2,678
Nails, keg.	17	68
W. h' barrels, cs.	1	13
Ag. imp, pkgs.	3	815
Rif., cs.	3	815
If. iron, pkgs.	22	320
R. goods, case	1	10
Clocks, bxs.	4	95
On safe.	13	342
W. mills, cs.	7	81
Nails, bxs.	2	34
Guns, box.	6	54
Iron rope, coil	1	485
<b>Cork.</b>		
Ptm., gals.	125,520	9,000
<b>Glasgow.</b>		
Mach'y, pkgs.	3	400
Hdw., pkgs.	17	5,6
If. iron, pgs.	21	745
Ag. zinc, bbs.	100	912
Rif., cs.	1	140
Mach'y, pkgs.	93	1,900
Gr. press.	1	50
<b>COAL.</b>		
Within the past few years the Anthracite Coal companies have advanced their prices 10¢ at 15¢ per ton. The Pennsylvania Coal Company only adds the former rate, and excludes from its operation the two rance sizes, Steam and Pea. The Lehigh companies have decided nothing, but leave quiring minds to infer that an advance for ginst is possible. Perhaps they first wish to learn from others in the trade how far an advance on paper is realized in cash. The fact is that if Coal supplies at the present rate of production run short, the advance will be obtained; if otherwise, it will not. There is a fair business in progress, and the spirit that preceded Aug. 1 has delayed. The prices announced by the Delaware and Hudson Coal Company are as fol-		
Mf. iron, pgs. 1 223		
British North American Colonies.		
Mach'y, pkgs. 1 120		
If. iron, pkgs. 14,761 1,545		
I. ore, tons. 1 2,451 1,545		
St. Louis.		
Ptm., gals. 304,178 24,733		
Cuba.		
Iron, pkgs. 29 262		
Hdw., pkgs. 183 4,860		
Nails, pkgs. 10 127		
Pumps, pkgs. 7 265		
Boiler. 1 1,700		
Pins, pkgs. 1 300		
Ag. imp, pgs. 60 2,674		
Nails, pkgs. 10 127		
Iron bars. 10 595		
T hoops, sets. 30 312		
Sew. ma., cs. 97 1,383		
Ptm., gals. 117 827		
Furnace mtl.		
pkgs. 159 1,440		
Plumes, case. 1 61		
Ptm., gals. 179,415 18,380		
Nails, pkgs. 10 127		
Mach'y, pkgs. 125 70,34		
Nails, keg. 160 80,34		
Clocks, pkgs. 8 40		
Mf. iron, pgs. 5 30		
Cutlery, cs. 1 200		
Spikes, keg. 254 30		
Buckles, case. 1 1		
Mf. cop. pkgs. 16 3,340		
Ptm., gals. 122,501 12,251		
Pumps, pkgs. 3 75		
Locomotive. 1 6,665		
Canary Islands.		
Saws, cs. 3 96		
Pumps, pkgs. 3 35		
Revolvers, case 1 50		
Sew. ma., cs. 31 393		
Ptm., gals. 122,501 12,251		
Hdw., pkgs. 43 1,952		
Ag. imp, pkgs. 43 1,952		
Mf. iron, pgs. 2 25		
Cartridges, case 1 15		
Japan.		
Hdw., pkgs. 30 467		
Ptm., gals. 620,000 62,000		
Hdw., pkgs. 15 114		
Hong Kong.		
Hdw., pkgs. 9 220		
Mf. iron, pgs. 43 333		
Ptm., gals. 368,800 33,000		
Porto Rico.		
Ptm., gals. 20,142 2,333		
Sew. ma., cs. 13 311		
Ag. imp, pgs. 6 545		
Scales. 6 310		
Mach'y, pkgs. 4 40		
Brass, gds, cs. 2 285		
Hdw., pkgs. 14 260		
Mf. iron, pkgs. 60 718		
Metal, cs. 5 133		
Pumps, pkgs. 5 157		
Clocks, pkgs. 5 39		
Venezuela.		
Mach'y, cs. 3 300		
Ptm., gals. 122,501 12,251		
Mf. iron, cs. 1 100		
Salonica.		
Ptm., gals. 135,450 14,000		
Smyrna.		
Pumps, box. 1 50		
Mexico.		
Ptm., gals. 12,550 1,385		
Iron safe. 1 70		
W. closet. 2 88		
Pumps, pkgs. 17 1,027		
Brass, pkgs. 160 3,611		
Clocks, pkgs. 1 44		
Saws, case. 1 6		
Cutlery, pgs. 18 482		
Nails, keg. 120 2,040		
Mach'y, pkgs. 122 7,496		
Tin, cs. 4 49		
Sew. ma., cs. 119 2,170		
Ag. imp, pkgs. 11 174		
Brass, gds, pkgs. 1 24		
Firearms, cs. 25 7,950		
U. C. keg. pgs. 11 374		
Nails, keg. 1 5		
Trieste.		
Ptm., gals. 415,862 66,600		
Havre.		
Pumps, pkgs. 12 650		
Sew. ma., cs. 672 9,743		
Ag. imp, pkgs. 17 1,322		
Naph, gals. 117,400 8,250		
Hdw., pkgs. 8 235		
Brass, gds, pkgs. 1 24		
Wire gds, cs. 24 600		
Copper, coil. 180 45,000		
Ptm., gals. 235,102 15,728		
Bordeaux.		
W. mills, cs. 97 730		
Hdw., pkgs. 7 70		
If. iron, pkgs. 10 125		
Stpd. wr. cs. 4 75		
Marseilles.		
Clocks, cs. 5 124		
Genoa.		
Hdw., pkgs. 9 833		
Sew. ma., cs. 73 750		
Barcelona.		
Firearms, case 1 80		
Pistols, cs. 1 20		
Sew. ma., cs. 113 1,520		
Africa.		
Pumps, pkgs. 1 20		
Iron safe. 1 78		
Ptm., gals. 122,501 12,251		
Br. kettles, cs. 3 357		
Hayti.		
Ptm., gals. 122,501 12,251		
Br. goods, case 1 47		
If. iron, pkgs. 17 207		
B. bxs. 17 207		
Chain, cs. 1 1		
Anchors 1 1		
Nails, keg. 61 203		
Cutlery, cs. 4 84		
Shot, pkgs. 8 71		
Iron safe. 1 45		
Brazil.		
Hdw., pkgs. 88,000 9,685		
Ptm., gals. 122,501 12,251		
Mach'y, pkgs. 30 2,654		
Pumps, pkgs. 2 178		



rather stiffer, my latest advices showing 44/ for No. 3 pig, as compared with the 36/ of the last few weeks. I am not sure, as I write, whether 44 is a general quotation, but I have it from a reliable firm of merchants, who are scarcely likely to be head of makers. For G. M. B., f. o. b. at makers' own wharves in the Tees, the rates







IF DEALERS WILL LOOK INTO THIS MATTER OF

**JACK SCREWS,**

They will find that ours are much better made than any others in market. And furthermore, that by weight they are the cheapest. The same is true of our Bench Vises. We could cut down the weight one-quarter and it would hardly be noticed, but in using the Jacks under great strain somebody might get hurt. It is better for all concerned to make reliable goods, and sell them at a price based on quality, so that when they are put on the market they will stay. We guarantee the quality of all our goods, so that dealers take no risk whatever.

Diam. of Screw.	Height.	Net rise.	Whole height.	List Price.
1 1/2 inches.	8 inches.	4 inches.	12 inches.	\$2.50
1 1/4 "	7 "	3 1/2 "	11 "	3.00
1 3/8 "	6 1/2 "	3 "	10 1/2 "	3.25
1 1/2 "	6 "	2 1/2 "	10 "	3.75
1 1/4 "	5 1/2 "	2 1/4 "	9 1/2 "	4.00
1 3/8 "	5 "	2 1/8 "	9 "	4.25
1 1/2 "	4 1/2 "	2 "	8 1/2 "	4.50
1 1/4 "	4 "	1 3/4 "	8 "	5.00
1 3/8 "	3 1/2 "	1 1/2 "	7 1/2 "	5.50
1 1/2 "	3 "	1 1/4 "	7 "	6.00
1 1/4 "	2 1/2 "	1 1/8 "	6 1/2 "	7.00
1 3/8 "	2 1/4 "	1 1/2 "	6 "	8.00
1 1/2 "	2 1/8 "	1 1/4 "	5 1/2 "	8.50
1 1/4 "	2 1/2 "	1 1/8 "	5 "	9.00
1 3/8 "	2 1/4 "	1 1/2 "	4 1/2 "	11.00
1 1/2 "	2 1/8 "	1 1/4 "	4 "	13.00

**MILLERS FALLS COMPANY**

74 Chambers St., New York.

**CHAMPLAIN****Forged Horse Nails.**

MANUFACTURED BY THE

**NATIONAL HORSE NAIL CO.,**

Vergennes, Vermont.

HOT FORGED AND COLD HAMMERED POINTED. MADE OF BEST

NORWAY IRON AND WARRANTED.

WAREHOUSE

97 CHAMBERS AND 81 READE STREETS, NEW YORK.

**DURRIE & McCARTY, Sole Agents.****Amesbury's Band Saw Setting Machine.**

Patented, May 2, 1882.

WILL SET SAWS FROM 1/4 INCH TO 2 INCHES WIDE ACCURATELY

AT THE RATE OF

300 Teeth per Minute.

This engraving represents our new Band Saw Setting Machine.

It is designed and constructed upon entirely new principles, and

embodies all the good features of hand-work

in combination with the speed and regularity

of machine work. The users of hand saws

have long felt the need of a machine that

would hold a narrow saw in a rigid position

and set the teeth without straining the blade;

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vise, and remains immovable while the tooth

is set to any degree required. As the crank

goes forward, the blade is released, when

the next tooth is fed up to the dies, the

blade again locked in vise, and this tooth set

in the opposite direction. All these move-

ments are automatic, and can be carried on

at a speed of 300 teeth per minute. The feeder

takes up only the tooth that is to be set, conse-

quently each tooth is fed to its proper posi-

tion, regardless of their irregularity. No

further expense is required outside of the

machine, as the band saw is simply hung up

over the machine on a wooden bracket, and

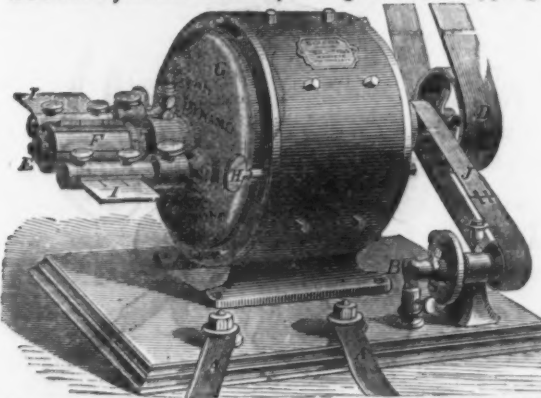
the lower part left pendant near the floor.

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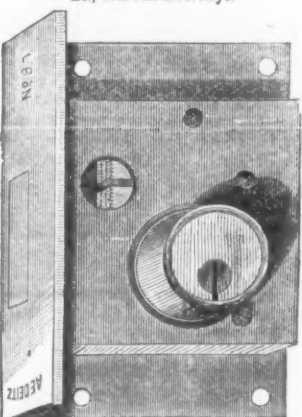
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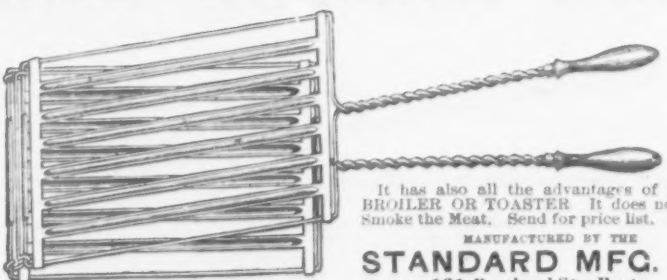
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**IRON & BRASS WOOD SCREWS.**

Quality, finish and tests as to strength guaranteed equal to any in the market.

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It has also all the advantages of a FIRE BROILER OR TOASTER. It does no basting. Smoke the Meat. Send for price list.

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## Tin Plates and Brands.

The London Ironmonger says: 'The question of private and other brands of tin plates is again being discussed in our pages, just as the same subject is undergoing similar investigation on the other side of the Atlantic. In neither country is the issue satisfactory—so far as it has been developed—and in neither are consumers content to rest satisfied with the existing state of affairs. The two cases are almost on all-fours, with the exception that we have all the makers here, and can reach them rather more promptly and directly than our American friends are able to do. In both countries there is a deep discontent on the subject of quality as represented by brands, coupled with which is a strong disposition to throw all the blame upon the shoulders of the dealers or merchants. One of our recent correspondents leveled serious allegations against those merchants who indulge in what he terms the 'vicious' practice of using private brands, while our other correspondent, 'Tinplate,' defended the practice, and professed his intention to continue its use. Both writers, no doubt, have a certain amount of argument in favor of their respective views. From the makers' standpoint there is doubtless a vast amount of mischief done by private brands—indeed, it is altogether surprising that the manufacturers should ever have permitted their business to be virtually controlled by other persons. At the same time it must be remembered that a similar usage obtains in several other industries. Many of our leading cutlery, edge-tool, brass-founding, lock, &c., houses sell goods bearing their marks which are not of their own make. In most cases, however, the trademark or name is supposed to guarantee the quality of the goods, and the vendor, whether the actual maker or not, is the person upon whom the retailer and consumer rely. In the tinplate trade, on the other hand, the consumer or retailer knows nothing of the real producer. To him, as the trade is now conducted, the brand represents everything. He is supposed to know what brand suits him, and he buys that class of plates in the belief that he is getting goods equal to his former experience, or the general reputation of such brand. Provided the plates answer the purposes for which they are needed, the transaction ends satisfactorily, and there is no room for complaint. As a matter of fact, however, widely different results very frequently come about. It is found, in practice, that the same brand does not invariably cover the same kind of plates, and especially so, it is urged, where the goods are purchased from merchants. Makers, however, are not by any means exempt from similar variations—indeed, we heard of an instance last week in which a certain brand of plates, made by one of the oldest and best firms, had twice recently been found inferior in quality, and utterly unsuitable for a class of wares for which it had been used for years. This, of course, may be deemed accidental, yet it is a fact to be borne in mind when considering this particular difficulty. That makers have a more direct and positive interest in maintaining the reputation of their brands is not to be denied, and they would exercise even greater care in that respect were the system of direct dealing more generally observed. Merchants' brands are necessarily more uncertain, seeing that they are often made for nobody in particular in the first place, are largely produced by needy makers, and are not infrequently the outcome of negotiations in which price is the sole consideration. The same brand does not in reality cover the same class of plates; hence the constant complaint that a brand which answers well one week will not serve for the same goods another week. It may be, of course, that merchants themselves are also deceived, in which case the system stands further condemned. In any case, it seems to us that consumers have the remedy entirely in their own hands. Instead of relying simply upon brands, let them buy with a distinct statement of the uses to which the plates are to be put. They ought then to obtain exactly what they require whether they buy from makers or merchants, and may insist upon having just what they need. The system of brands would thus be superseded to a great extent, and the present anomalous condition of affairs thoroughly swept away. If consumers would do this, and makers at the same time endeavor to form closer relations with actual users, we should soon cease to hear complaints as to private or any other brands.'

**The Spanish Trade Mark Treaty.**—Mr. Davis, who supervised the preparation of the Spanish trade-mark treaty, says that it was drawn after the usual form in the book of trade-mark treaties, all of which follow one pattern, reciting that whereas the President and the King of Spain desire to secure guarantees of property in trade-marks, the Secretary of State and the Spanish Minister Plenipotentiary on one side and the Spanish Foreign Secretary on the other side have agreed to certain articles—one forbidding reproduction of the trade-marks of citizens of one country by citizens of the other, and authorizing the injured party in case of infringement to recover damages. No exclusive right of use of trade-mark, however, can exist beyond the time fixed by law in the country in which it is used. Article 2 provides that a resident of one country desiring to use his trade-mark in both countries must file duplicate copies of those marks at the Patent Office here and the corresponding office in Spain. Article 3 provides that the arrangement shall go into effect 90 days after ratification and continue in force 10 years, or as much longer as mutually desired, 12 months' notice being required to discontinue, even after the expiration of 10 years. Article 4 states that ratification shall occur within 12 months, and closes with the attestations of the Secretary of State and corresponding officer of the other country.

M. Bonquet de la Grye recently made a series of observations relating to the density of sea water and its proportions of salt. Many meteorologists have thought that there should be an intimate relation between the amount of salt of the ocean and the currents which traverse it, but processes of exact in-

vestigation have hitherto been employed only in laboratories and upon a limited number of samples. The above mentioned gentleman has employed Mohr's processes for the investigation of chlorides, which is not only exact, but can be employed upon shipboard under all circumstances. It requires neither accurate weighings nor numerous precautions. The moment is marked at which a change of tint is made by the addition of bichromate of potassium, and a simple reading upon a graduated tube or counting the drops of the experimental liquid, is sufficient to give with great accuracy the weight of the chloride which is contained in a given quantity of the water. By means of this process M. Bonquet de la Grye has constructed a chart of the relative levels of the Atlantic Ocean between 15° and 45° north latitude.

## The River Fire Service.

For a city having such an extensive water front as New York, with piers containing warehouses in which much valuable freight is constantly stored, and with steamboats and craft of various kinds likely to suffer in case fire breaks out on the river front, a river fire service is a necessity. One of the daily papers recently contained an account of how our river fronts are protected by the fire department. The story is quite interesting, and we reproduce it in full in this connection. Whenever there is an alarm of fire along the river fronts of the city, the signal is transmitted to the fire boat William F. Havemeyer, which is stationed at the bulkhead on the south side of pier 1, North River, with steam always in the boilers. Instantly the lines are cast off and the tug puffs away to the point of danger. When tied to the bulkhead the fire boat has precisely the same communications with the fire signals of the city as are seen in any of the fire engine houses, a small cable that can be readily jointed or disjoined with the land wires connecting with the gongs and alarms on board. There is telephonic connection with all the engine-houses and with headquarters.

The fire boat was built in 1875, by order of Fire Commissioners Cornelius Van Cott, Joseph L. Perley, and Roswell D. Hatch. She was named after Mayor Havemeyer, who appointed the Commissioners. Her builders were Wood & Dialogue, of Camden, N. J. She has a powerful marine condensing engine, and can keep up with the fastest tugs in the harbor. During the seven years that she has been in service the fires have not been out except for brief intervals for inspection and repairs. She is commanded by Capt. Robert S. Farrell and First Lieut. William C. Braisted. There are two engineers, two pilots, and eight firemen. More than half of the men are constantly on duty, and the service is very exacting. The men take turns in six-hour watches, and when fires are frequent or of long duration the men become greatly exhausted. The boat went on duty at the great South street fire last Christmas, and was not relieved until Jan. 2. A constant stream was kept playing on the fire during the whole of that time.

The fire apparatus on the Havemeyer is very effective. There are four Amoskeag pumps, capable of throwing 2000 gallons of water a minute. This may be thrown through eight different streams or concentrated in one. It is claimed that the pumps can throw a 2½-inch stream of water 250 feet. The boat is provided with 4000 feet of the best rubber hose, a dozen nozzles of various patterns, axes, hooks, lanterns, &c. Although the boat can be worked with five men, it is necessary to have more to run out the heavy hose. Land aid is used for this purpose, and the fire boat company works, like any other fire company, under the immediate direction of the chief engineer. If the boat arrives at a fire when there is no available aid from the Fire Department, civilians are called upon to lend a hand in stretching the hose. The commander of the fire boat reports to the officer having charge of a fire the same as captains of any company. Two men are always on watch on the fire boat, day and night. The others must remain within call. Near by is a hydrant, and about 90 tugboats go daily to Pier 1 to get water for their boilers. Captain Farrell thinks it is not only a nuisance on account of the constant bumping against the fire boat, but also because of the frequent delay in getting clear of the tugboats' lines.

The fire boat can answer an alarm as high as Twelfth street in 12 minutes. She is expected to answer calls within the city limits in both rivers, and has often proved of service in saving the property of our neighbors. Once she went to Tarrytown. At the recent fire in the Havemeyer sugar houses in Brooklyn, the fire boat Havemeyer did good service in saving the property of the Havemeyer family, a feat that then was remarked as of singular fitness. When the Hoboken Fire Department rebelled and refused to do duty, the Havemeyer went over to the fire, which broke out on the old Eagle dock, and, by prompt aid, saved the shipping and piers of the entire river front of Hoboken, including the costly ferry houses of the Hoboken Ferry Company. The men of the fire boat never got a cent of recompense for this heavy extra duty, and some ungrateful Jersey scamp stole Capt. Farrell's \$200 overcoat. When the brig Grahams Polly took fire in the bay, having on board 2700 barrels of kerosene oil, the fire boat went to her assistance and saved 1300 barrels of the oil. They would have saved more, but a tugboat Captain took the bark to shallow water, where she could not be submerged. The boat was called to the great cotton fire at the foot of Bank street on Feb. 22 last and kept there until March 1. The pumps were kept going without stopping 144 hours. One of the great advantages of using the fire boat for such purposes is that she uses river water entirely. When a fire needs to be drenched out by the week, that is a great saving of the Croton water. It has been even suggested that all fires might be best put out by pumping up water from the river. The objection to the use of river water is that it damages goods more than the clean Croton water. When the fire boat gets into shallow water the pumps are liable to draw up mud. To obviate this the fire boat is provided with outboard suction that are used to take water from the surface of shallow places, instead of pumping from the bottom.

It is estimated that the duty performed by

the fire boat equals that of the ordinary fire battalions. At the recent lumber-yard fire at the foot of Twenty-first street, the fire boat was at work 51 hours. At the burning of a tugboat in the East River, on March 26, the fire boat worked seven hours. On April 29, at the great hay fire in West street, the fire boat did good service. On the 18th ult. about 50 bales of shavings caught fire at Pier 32, and would have played and havoc but for the fire boat. Several members of the fire-boat crew have done good service in saving the lives of seven persons, who have either fallen or been thrown into the river at the Battery. Among those saved by Captain Farrell, Firemen McClair, Hamilton, Stokes, Lynch and others were an unfortunate German named Heffernan, who had \$2000 in his pocket, and a wretched woman who had been thrown off the dock by some of the roughs of the First Ward. The Captain also saved an unfortunate pup found struggling in the bay, and the dog has become a pet with the men, who have named her Nellie. She pays her board by keeping off the tramps, who are always ready to slip on board and steal whatever they can lay hands on. The Fire Commissioners long ago concluded that a fire boat on each river front is a necessity. The Havemeyer has saved almost the worth of her weight in gold, and the danger of leaving the river front exposed while she is undergoing needed repairs has long been felt. A new fire boat has been ordered, and is now under contract at Wilmington, Del. She will be more effective than the Havemeyer.

## LABOR AND WAGES.

It is reported that the National Tube Works Rolling Mill, at McKeesport, Pa., will start non-union. One of the Pittsburgh papers having stated that Mr. Flagler had said he would run the mill "black sheep," the following card has been issued:

To the Editors of the Dispatch.—We notice in your issue of this morning that you report our General Manager, J. H. Flagler, as having stated that he considered it entirely feasible to run our rolling mill as a "black sheep" mill. We beg to state that our General Manager never made use of that language, and, moreover, we consider the term "black sheep" as an insult to every honest man who prefers work and the support of his family to enforced idleness. Furthermore, it has never been the intention of the company to employ anybody, either in the rolling mill or in any department of their works, to whom that term would be applicable; on the contrary, we have always paid, and propose to pay in the future, the highest wages paid in any rolling mill in this district, or at least the ruling wages paid by all the mills, and under those circumstances and in consideration of that fact, nobody has been as yet nor will be employed by the company to whom the term we have above referred to will be in any way applicable. Will you kindly state this in the next edition of your paper, and relieve from the minds of everybody, who saw the previous article, the impression which may prevail with some, that this term was ever used by us or by any officer of the company who has any authority to speak for them.

Yours respectfully,

NATIONAL TUBE WORKS CO.  
McKeesport, July 27.

The National Lodge of the Amalgamated Association met in Chicago on Tuesday.

The window glass workers of America held their National Convention at Kaufman's Hall, Pittsburgh, beginning Tuesday morning, July 11th, and closing Saturday, 14th, at noon. There was a representative from every factory in North America, and aside from the routine business, consisting of amending of old and enactment of new laws for the government of the organization, it was decided that a uniform list of wages for North America be adopted. The list adopted was last year's Pittsburgh list—the North and East to work for 10 per cent below the card.

At a meeting of the proprietors of rolling mills held in Youngstown, Ohio, on the 26th ult., at which every mill was represented, after a full and free discussion of the situation, it was unanimously decided not to sign the new scale, and to firmly maintain the stand taken by them at the beginning of the strike.

The Miners' Association of Western Pennsylvania has been swallowed up by the Knights of Labor, just as the Glass Blowers' Union had been previously. They will be known as District Assembly No. 9. The district was established in 1877, and its territory includes all the bituminous district whose product is shipped to the West. Immediately before and after the 3-cent strike of 1879 the organization grew very rapidly, but the interest flagged, and a little over a year ago but few assemblies held their charters. Since then the number in good standing has been increased to 32, with a membership of 3000. The work of organization is being pushed forward, and it is claimed that before fall the number of members will be increased to 10,000. When all the miners of the district have been enrolled, an enthusiastic member states that it is intended to send organizers out to Ohio, and that after that time there would be no strikes, as if all were Knights of Labor they could limit the production by suspension of operation, and so maintain a uniform rate that would be satisfactory to both parties. This scheme will involve the abandonment of the miners' organization, of which D. R. Jones is president, but it is pretty generally understood that Jones wants to quit engineering the affairs of the miners in order that he may practice law. It is stated that none of the numerous coal strikes of late years have been ordered by the Knights of Labor as an organization, but have been ordered by the Miners' Association, of which Jones is president, and which is composed of Knights of Labor and miners who are not members of that organization.

Mr. Chisholm, of the Cleveland Rolling Mill, having refused to recognize the union in any way, or to give the men who struck their places which had been filled, they have decided to insist on their former demands, or, in other words, another mill will be added to the list that the Labor Tribune claims is on a strike months after they are running full.

NO PRIVATE BRANDS IMPORTED.

We have in stock the following well-known standard makers' Brands of Charcoal

## ROOFING PLATES,

PRIME AND WASTERS.

M. F.  
PONTYMISTER REDIPPED.  
MELYN.  
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ALSO,

COKE ROOFING,

For Sale at Lowest Market Figures.

**MERCHANT & CO.,**  
PHILADELPHIA.

July 15th, 1882.

THE  
Morgan Variable Blast  
WATER TUYERE IRON

With the front plate removed, showing the rotating air tubes, through which four different currents of air may be passed, thereby making any sized fire, from two to eighteen inches in diameter. It actually SAVES ONE HALF OF THE COAL, makes an intense heat just where it is needed, and burns NO COAL unnecessarily; always gives a center blast, and cleans all the dirt from the fire; supplies hot water. We also furnish a Tuyere on same principle without water attachment. All goods guaranteed to please or no sale. Catalogue sent free. Special inducements to the trade. Address

**A. W. MORGAN & CO.,**  
52 VANCE BLOCK, INDIANAPOLIS, IND.

INDIANAPOLIS, July 11, 1882.

Messrs. A. W. Morgan & Co.  
Gentlemen: I have tested your Variable Blast Tuyere Iron, and pronounce it a perfect success. It does all you claim for it. Makes a large or small fire at will; gives a center blast; saves time, labor and coal, and it heats much more rapidly.

AUGUST ALTON.

NIRVANA, MICH., Oct. 10, 1881.

A. W. Morgan & Co.  
Dear Sirs: I have tested your Variable Blast Tuyere Iron perfectly. I can take a larger heat with less coal and labor than any other iron I ever saw. It is second to none. I have welded a four-inch bar with the smallest blast for a test.

Yours truly, DANIEL MERV.

LEXINGTON, MICH., Oct. 16, 1881.

A. W. Morgan & Co.  
We are well pleased with our Tuyere Iron. It gives the best satisfaction, and is a great saving in coal.

W. J. BAKER & CO.

INDIANAPOLIS, IND., April 28, 1882.

Messrs. A. W. Morgan & Co.  
Dear Sirs: We take great pleasure in recommending your Tuyere. We believe it the very best made. Yours,  
INDIANAPOLIS MACHINE & BOLT WORKS.

JUST OUT!

Anchor Lock Faucet.

MANUFACTURED ONLY BY

PENFIELD BLOCK CO., Lockport, N.Y.



Patent Applied For.

**HENRY B. NEWHALL,**  
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NEW YORK AGENT.

Sample Orders Solicited.

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CHICAGO AGENTS.

ALL MAKES OF  
**BARBED FENCE WIRE,**  
Stretchers, Diggers, Staples, &c. And  
**LOWE'S METALLIC PAINT,**  
The Great Railroad Paint.

**CHARLES E. McBRIDE,** Eastern Agent, 197 Pearl Street, New York.  
Also, Boston, Philadelphia and Baltimore.



# DE-OXYDIZED BRONZE,

PATENTED.

Is composed of **LAKE COPPER** and best **ASIATIC TIN** in any proportion required, so as to be either as ductile as copper, as tough as iron, or as hard as steel, according to the proportion of Copper and Tin used.

The process of making the alloy is what constitutes its superiority over any other known alloy of Copper and Tin or any other Bronze composition.

The castings made from this metal, owing to its perfect fluidity when melted, possess great density, perfect soundness and homogeneity. Unlike certain bronze and other compositions, it can be handled without the least difficulty by any ordinary founder, as it flows like oil in pouring.

**TENSILE STRENGTH OVER 90,000 POUNDS TO THE SQUARE INCH.**

We claim for it

1. **UNEQUALED ENDURANCE.**
2. **SUPERIOR ANTI-FRICTION QUALITIES** to any other known Bronze or Brass.
3. **GREAT MALLEABILITY AND TENACITY.**
4. **SUSCEPTIBILITY of the HIGHEST FINISH** on account of its homogeneity and smoothness of surface.
5. **JOURNAL BEARINGS** made of D. O. B. require **ONE-FOURTH** less **LUBRICATING MATERIAL** than any other metal yet known.
6. It is superior to all other bronze for the following purposes :
  1. Engine, Car, and Machinery Journals.
  2. Pumps, Valves and Linings, Cylinders, Pinions, Gogs, Plungers, Crank Pins, &c.
  3. Car Trimmings, Harness and Coach Furniture, House Hardware, Steam Fittings, &c.
  4. Wire Sheets, Rods and Tubes.
  5. Bells, Gongs, Ordinance, Boilers, Fire Boxes.
  6. Tuyeres (For this Purpose it has no equal).
7. **ART METAL WORK** it finishes as handsome as Gold.
8. **CHIMES AND PEALS OF BELLS.**

We are making a specialty of Chimes and Peals of Bells from 2000 pounds the Peal up to 25,000 pounds Chime of 9 Bells, or any greater weight or number of Bells. We also furnish small and large Bells singly of all descriptions. Send for Circular.

Henry Disston & Sons, Saw, Tool, Steel and File Works, Front and Laurel Streets, Philadelphia Smelting Company:

Philadelphia, October 4, 1879.  
GENTLEMEN: After a trial of eighteen months of your "DE-OXYDIZED BRONZE" as Journal Boxes in our Rolling Mill, where great pressure is required, we take pleasure in recommending it as being superior to any we have heretofore used. Very truly,  
HENRY DISSTON & SONS.

Office of Eagle Iron Works, 1162 North Third Street, Philadelphia, August 29, 1879.

GENTLEMEN: In reply to yours of the 28th inst., we beg to say that we have been using your "DE-OXYDIZED BRONZE" for over a year, and have found it better than any composition boxes we have used; and as long as you continue to make it the same quality, we shall use no other metal in our Engine Boxes. We therefore take pleasure in recommending it to Engine Builders in general.  
Yours respectfully,  
HOFF, FONTAINE & ABBOTT.

Office of Union Brass Manufacturing Company,

CHICAGO, Dec. 23, 1880.

Philadelphia Smelting Company, Limited, Twelfth and Noble Streets, Philadelphia, Pa.:

DEAR SIRS: In reply to your inquiry of yesterday as to our opinion of "DE-OXYDIZED BRONZE" for Railway Coach Trimmings, I beg to submit that we have used it up to present writing for the trimming of something over 100 coaches. One marked peculiarity of this metal, when highly finished, is non-liability to abrasion, and its non-affinity with the gases of the atmosphere, which in embossed work is a great desideratum. To those willing to pay more in the first cost, we would confidently recommend "DE-OXYDIZED BRONZE" Trimmings as cheaper in the end.  
Yours very truly,  
J. HALL DOW, President.

Cowles Hardware Co., Manufacturers of Solid Bronze Butts and Blanks, Unionville, Conn., say—  
"We use only 'DE-OXYDIZED BRONZE,' which is superior to any other metal known for our purposes, as it is of unequalled endurance in resisting friction and susceptible of the highest finish."

We can also refer to many large concerns, in addition to above, who are using it in preference to any other.

## DE-OXYDIZED COPPER.

We are making "PURE" Sheet Copper and WIRE. Its tensile strength is double that of ordinary Copper Sheet and Wire, and it is perfect in its texture.

## GENUINE BABBITT.

Our Genuine Babbitt is superior to all other makes in the market in every particular. We guarantee it to be perfect in its Anti-friction qualities in machinery AT A SPEED OF 10,000 PER MINUTE, or at 1000 TONS PRESSURE for 10 YEARS. We append below testimonials from Al houses justifying us in the above claims.

WORCESTER, MASS., April 21, 1881.  
We have used your "Genuine Babbitt" about 4 years on our wood-cutting machinery bearings, run at a speed of 2500 revolutions per minute, and always with entire satisfaction.  
G. W. INGALLS & CO.

NEWARK, N. J., Dec. 19, 1881.  
Gents.—We have received word from our 8-ton forging machine. The Babbitt Metal Bearings in main shaft are 8 inches diameter by 1 1/4 inches long each, and in the Caps and Crank Bearing 8 x 1 1/4 inches. The machine strikes 18,000 blows daily making wrenches. It has run steadily for 2

years, and has never had a liner taken out in any part. The crank-shaft and parts on it weigh above 4000 pounds. The shaft makes about 250 revolutions per minute. Your Genuine Babbitt, now exclusively used by us, has given us the best satisfaction. We have tried almost all other makes in search of a good article.  
E. GOULD & EBERHARDT,  
Machinists' Tools, &c.

NEW HAVEN, CONN., April 11, 1881.  
We have used your "Genuine Babbitt" in our Challenge Rock Breaker with excellent results, and

are pleased to testify to its merits for Journals where high speed and great pressure are required.  
BLAKE CRUSHER CO.

WORCESTER, MASS., April 24, 1881.  
Having used your "Genuine Babbitt Metal" for over 4 years on machinery that runs over 9000 turns a minute, on 1 in. shaft, 3 in. journals, I can safely recommend it for all you advertise it to do. Any person wishing to see the machinery or wanting further information can call or address:  
A. I. THOMPSON, Master Mechanic,  
25 Hermon street.

From J. L. MARSDEN, Supt.,  
FARRALL FOUNDRY AND MACHINE CO.,  
ANSORIA, CONN., Aug. 17, 1880.

The "Genuine Babbitt" we have bought from you gives perfect satisfaction in our Stone Breakers. We have it working in bearings 12 in. long and 5 in. diameter. One-half the revolution of shaft there is a pressure of 900 tons. The other half 256 tons. The shaft makes from 200 to 250 turns per minute. I think this is a very severe test, yet they have been running for more than one year.

From WITHERBY, RUGG & RICHARDSON,  
Manufacturers of Wood-Working Machinery,  
WORCESTER, MASS., Nov. 20, 1880.

Send us 1000 pounds "Genuine Babbitt," divided into Bars as usual. We think the continuance of our trade with you for the past 8 years, in the face of the constant effort made by other parties to divert our patronage, is a sufficient recommendation of your goods. We speed some journals as high as 6000. Yours truly,  
WITHERBY, RUGG & RICHARDSON

From this it will be seen that it can have no superior, or even equal, as an Anti-Friction Metal in anything manufactured. We make besides all grades of Anti-Friction Metals,

Letter A, Guaranteed at a speed of 2000.  
Letter D, Used for Shafting.

Letter B, Guaranteed at a speed of 1000.  
Letter E, Used for Ag'l Implements, &c.

Letter C, Guaranteed at a speed of 800.  
Letter A L, For slow speed.

All our Metals are made from best Lake Copper, Asiatic Tin, Cookson's Antimony and best Refined Lead, and in all cases run free at melting heat, without drossing, and without any necessity for heating the journals into which they are poured.

## MANUFACTURERS' AND MACHINISTS' NAME PLATES,

REAL BRONZE FINISHED.

Patterns from \$3 upwards, according to Size and Style.

Sketches furnished for approval before making Patterns.

We have a specialty in this line and produce a handsomer plate, at less money, than can be obtained elsewhere.

**PHILADELPHIA SMELTING COMPANY, Limited,**

S. E. COR. TWELFTH AND NOBLE STREETS, PHILADELPHIA, PA.



## METALLURGICAL NOTES.

## ROASTING ORES IN MEXICO.

The operation of roasting silver ores in Mexico previous to their being smelted, is described as follows in our contemporary *Iron*: In some places the ores are roasted in heaps, this being done by surrounding the mineral, broken into large lumps, with a layer of charcoal retained in its place by an open wall of rough stone built in a circular form. The openings in this wall admit the passage of the necessary amount of air, and the operation is completed in the course of 24 hours, with an expenditure of charcoal amounting to one-half the weight of the ores operated upon. At other places the ores are roasted in circular kilns 4 feet 6 inches in diameter and about the same height. These are formed of a lot of om wall of adobe or sun-dried bricks, and are without a roof, the walls being so constructed that the area of the openings is nearly equal to that of the brickwork between them. Each kiln is charged with about 2000 pounds of roughly broken ore mixed with one-half its weight of dried wood. The operation requires about a week for its completion, and can naturally be employed only during the dry season.

## THE PRODUCTION OF LEAD IN 1881.

The following table, showing the production of lead in European countries in the year 1881, has been given by Mr. Landsberg, director of the well-known Stolberg Co:

	Metric tons.
Spain.....	120,000
Germany.....	90,000
England.....	87,000
France.....	15,000
Italy.....	10,000
Greece.....	9,000
Belgium.....	8,000
Austria.....	6,000
Russia.....	1,500
Total.....	346,500

Mr. Landsberg estimates the production of the United States at about 110,000 metric tons, and disregarding the production of Mexico, South America, Canada and Australia as inappreciable, the production of the world may be considered to be somewhat over 400,000 tons. According to this statement the United States occupy second place in the list of lead-producing countries.

## A NEW DIRECT PROCESS.

A new process has been patented by Mr. J. C. Bromfield, of Brighton, England, for making iron and steel direct from the ore, and which, it is said, has been spoken of favorably by no less authority than Sir Henry Bessemer. Besides the main feature of the direct manufacture of the metal, the sub-products, notably the furnace gases, are saved and utilized. Mr. Bromfield mixes pulverized coal and iron ore in proportions varying, of course, with the nature of the materials, and when much silica is present, alumina with or without carbonate of lime is added. At the same time he extracts a mucilage by hydraulic pressure from seaweed steamed in a close-jacketed boiler. The powder and mucilage are intimately mixed with Portland cement, carbonate of lime, magnesia lime or calcium oxide in proportions varying with the nature of the ore; and this mixture is formed into bricks by a powerful press. When dry, the bricks are coked in a retort, whereby their sulphur and phosphorus are driven off. The gases are led through an hydraulic main and utilized, either for maintaining the combustion or for illuminating purposes, in which case the by-products are also turned to account. After coking, the bricks are ready for the smelting furnace, and, as it is claimed, produce a high class of metal, from which practically the whole of the phosphorus and other injurious elements of the raw materials have been expelled.

## Elevated Railways in Liverpool.

An elevated railway along the line of docks of Liverpool, England, which has just received the sanction of both Houses of Parliament, is an undertaking of a novel and unique character in railway construction. The Liverpool docks stretch along the frontage of the River Mersey to the length of upward of seven miles, from north to south, and the intended railway will run parallel to the docks on a high level above the ground line to their entire length. Communication will be established between the two densely populated localities at the extreme north and south ends of Liverpool, and stations will be erected at different points within those portions of the city immediately contiguous to the line of docks. The line will be carried on piers and columns at elevations of from 50 to 20 feet above the roadway, and will pass over thoroughfares leading from the interior of the city to the river. The Corporation of Liverpool and the Dock Board have agreed that in the construction of the railway the latter body shall erect several bridges at different points of specified width. There are no less than six of these bridges within the city boundaries, the spans varying from 50 to 60 feet. The Dock Board have also entered into a like arrangement with the Corporation of Bootle for erecting six bridges within that borough. The railway which is to be constructed is a double line throughout, is estimated to cost about \$3,200,000 for construction only, no purchases of land or compensation being required. The fares to be charged are about 6 cents per mile for first-class passengers, 4 cents per mile for second-class and 2 cents per mile for third-class. The Dock Board are empowered under the bill to borrow the whole amount required for the construction of the road, and passengers only are to be carried, the railway not being in any sense a freight line.

Mr. Thomson, the British Consul at Monte Video, in Uruguay, points out that with the exception of a French company, which is now working the mines at Cunapira, all the

industrial enterprises of any importance in the Republic are in English hands. Railways, tramways, telegraphs, banks, docks and gas and water supplies have been established by English capital and are handled by the English. In the rural districts extensive tracts of land were some years ago owned by the English, but the number which have made a specialty of this pursuit has of late decreased considerably. The constant liability to losses by pillage deters even the wealthiest farmers from investing in valuable stock and from importing and developing a more extensive and more remunerative breed of horses, cattle and sheep.

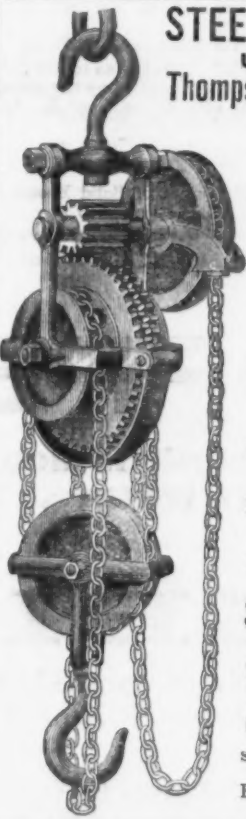
A curious piece of artillery has arrived at Windsor Castle, England. The weapon, which is believed to have come from some Eastern country, has seven barrels, the bore of which is rather larger than those of ordinary rifles, laid horizontally upon a wooden carriage, the central one being larger than the rest. At the breech is a groove for a train of powder to the touchholes, so that all the barrels can be discharged simultaneously.



CIDER AND WINE MILLS, \$15, \$18, \$22.50, \$30, List.

Press Screws, wrought and cast iron, \$3 to \$30. Presses, Berry, Wine and Cider, \$5 to \$25. Copper Strip Feed Cutters sell better than any other style of cutter, are easily and cheaply kept in order, and all ways give the best satisfaction. The copper does not dull the knives, and is more durable than rowhide. Twelve sizes, \$5 to \$35. All sizes are good for cutting Oats, Hay and Straw. \$50. 2 1/2 and 3 1/2 are especially good for Corn Stalks. Send for descriptive circular and trade discount. Lever Cutter, \$1.50 net; Burrall Corn Sheller, Improved, \$5.50 net; New York and Clinton Sheller, \$4.50 net; Wagon Jacks, \$1 per dozen; Fanning Mills, \$18 to \$27 flat; Corn Mills, \$5 to \$7.50 list. The "Cycle" (4 sizes) is the best power machine in the world for cutting green and dry fodder. \$50 to \$175. Repairs for many different Plows and Machines.

THE NEW YORK PLOW CO., Mfgs., Works, Yonkers, N. Y. 55 Beekman St., N. Y.



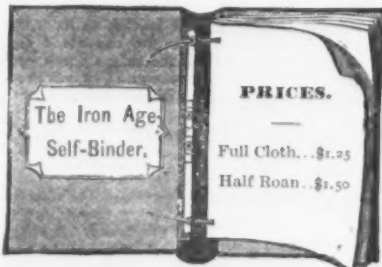
STEEL HOIST, UNDER Thompson's Patent

NO WORM GEAR. NO FRICTION BRAKES. MADE OF Annealed Cast Steel AND Malleable Iron. DOUBLE SPEED

1,000 to 40,000 Lbs. Capacity.

Sole Manufacturers in America. Steel Hoist MFG. CO. 170 to 174 Grand St., PITTSBURGH, PA. Send for Catalogue English Patent For Sale.

## Self-Binders for The Iron Age



We are now prepared to supply our subscribers with an excellent self-binder for their papers, a cut of which is annexed. We call attention to the low prices at which it is offered. Address all orders to

DAVID WILLIAMS, 83 Reade street, New York. DON'T BUILD A HOUSE Of any kind until you write for Prices and Samples to the BODINE ROOFING CO., Mansfield, Ohio.

## FOUNDRYMEN, ATTENTION.

## FOR POWER MOLDING MACHINES

SEND FOR DESCRIPTIVE CIRCULAR TO

AIKIN & DRUMMOND, Patentees, Louisville, Ky.



## RICHARDSON'S CELEBRATED SAWS



Richardson's Trade Mark. A Maltese Cross With the Letters E B S T, Emblematical of the Stamping of the Saws in the Trade.

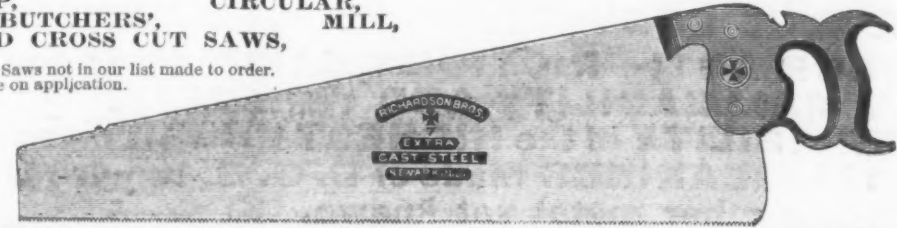
## RICHARDSON'S SAWS

Have Justly Obtained an Envyable Reputation.

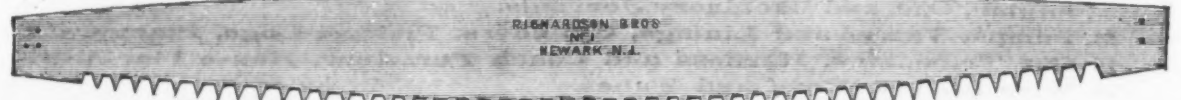
WE MAKE A FULL LINE OF

HAND, PANEL, RIP, BACK, COMPASS, CIRCULAR, BUTCHERS', MILL, AND CROSS CUT SAWS,

Special Saws or any Saws not in our list made to order. Illustrated catalogue on application.



Richardson's No. 7 Hand Saw, Cast Steel, Beech Handle, Polished Edges, Brass Screws, Rubbed Blade, Etched and Warranted.



RICHARDSON'S PATENT TEMPERED AND PATENT GROUND SAWS.

RICHARDSON SAW WORKS, 15 to 27 River St., Newark, N. J.

## DOUBLE ACTION RATCHET SCREW DRIVER.

ONE OF THE VERY BEST TOOLS EVER INVENTED.

It combines greater Strength, Convenience and Durability than was ever obtained in a Common Driver. Sells readily and gives Perfect Satisfaction.



Trade supplied by the principal Jobbers throughout the U.S. or by the manufacturers,

GAY & PARSONS, - - - Augusta, Maine.

FLAGLER, FORSYTH & BRADLEY, Agents, 298 Broadway, New York. Send for Price List.

## FOUNDRY FACINGS, PLUMBAGO &amp; FOUNDRY SUPPLIES.

## S. OBERMAYER &amp; CO.,

Manufacturers of and dealers in all kinds of

## FOUNDRY FACINGS AND BLACKINGS, PLUMBAGO AND FOUNDRY SUPPLIES.

Capacity of Works, 650 Barrels per day.

HEAVY MACHINERY and FINE STOVE PLATE FACINGS A SPECIALTY.

Office and Works, - - - CINCINNATI, OHIO, U. S. A. Send for Catalogue and Price List.

## V. G. HUNDLEY, PROPRIETOR OF NORTH CAROLINA HANDLE CO.,



MANUFACTURER OF Handles and Spokes, 79 Reade Street and 97 Chambers Street, NEW YORK. HARDWARE COMMISSION MERCHANT.



## STEPHENS PATENT VISE.

The most durable, and the only solid quick-working Vise, with automatic taper jaw attachment.

Will very soon pay for itself, in saving of time and labor.

For sale by the trade.

OFFICE:

41 Dey St., New York, U. S. A.



## HUBBELL'S PATENT METAL CORNERS

FOR OIL CLOTH, With Binding to Match.

Protect them from wearing and are ornamental. These goods need only be seen by the public; the real merits are at once appreciated. Sample orders solicited, and circulars sent on application.

RAY HUBBELL,

Patentee and Sole Manuf'r in U. S. and Canada.

Northville, Fulton Co., N. Y.



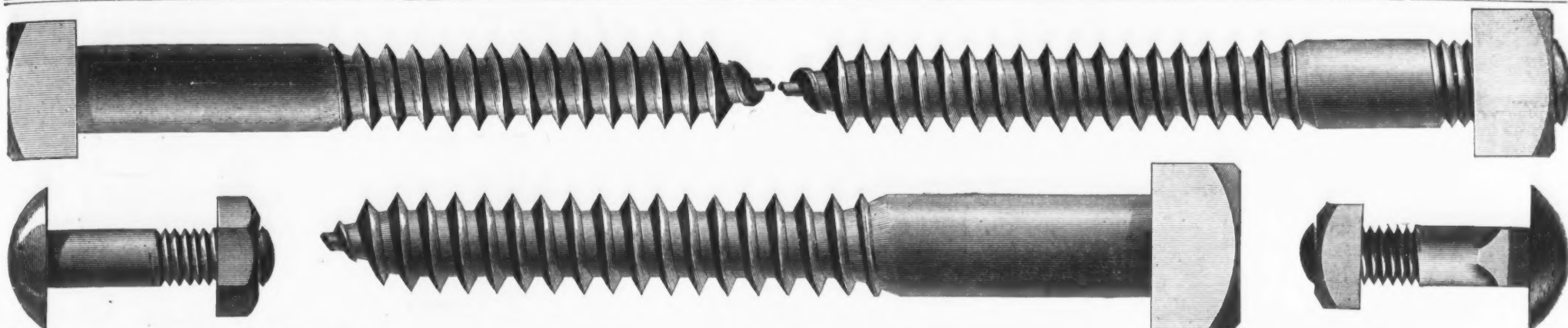
The Improved Coal Oil

(Kerosene) Vapor Lamp.

The best light for Rolling Mills, Foundries, Shops, &c. Used by all the largest manufacturers in the country. Gives perfect satisfaction. The new improvement makes it the Most Durable and Cheapest Lamp in the market. For further information, address,

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**Wm. H. Haskell Co.,**  
MANUFACTURERS OF

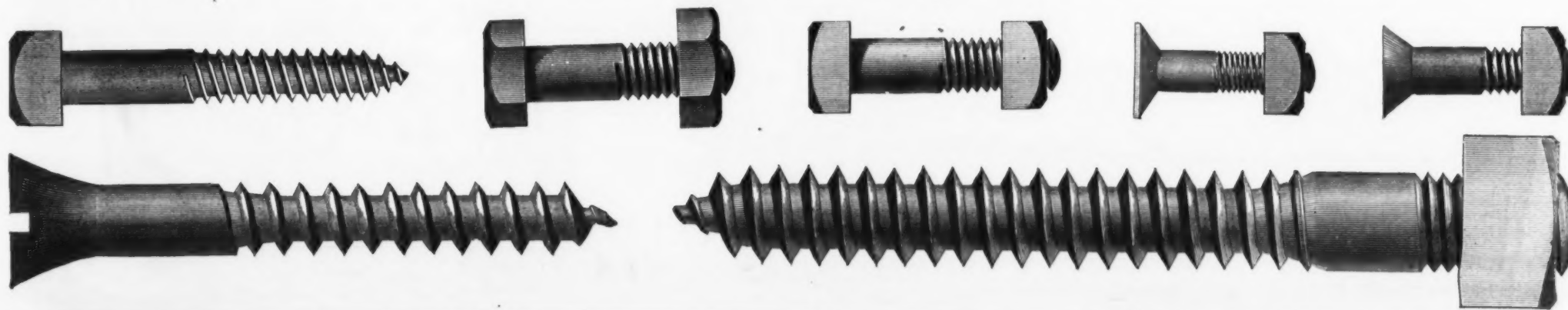
# BOLTS AND COACH SCREWS,

277 Main Street, Pawtucket, R. I.

Send for Catalogue.

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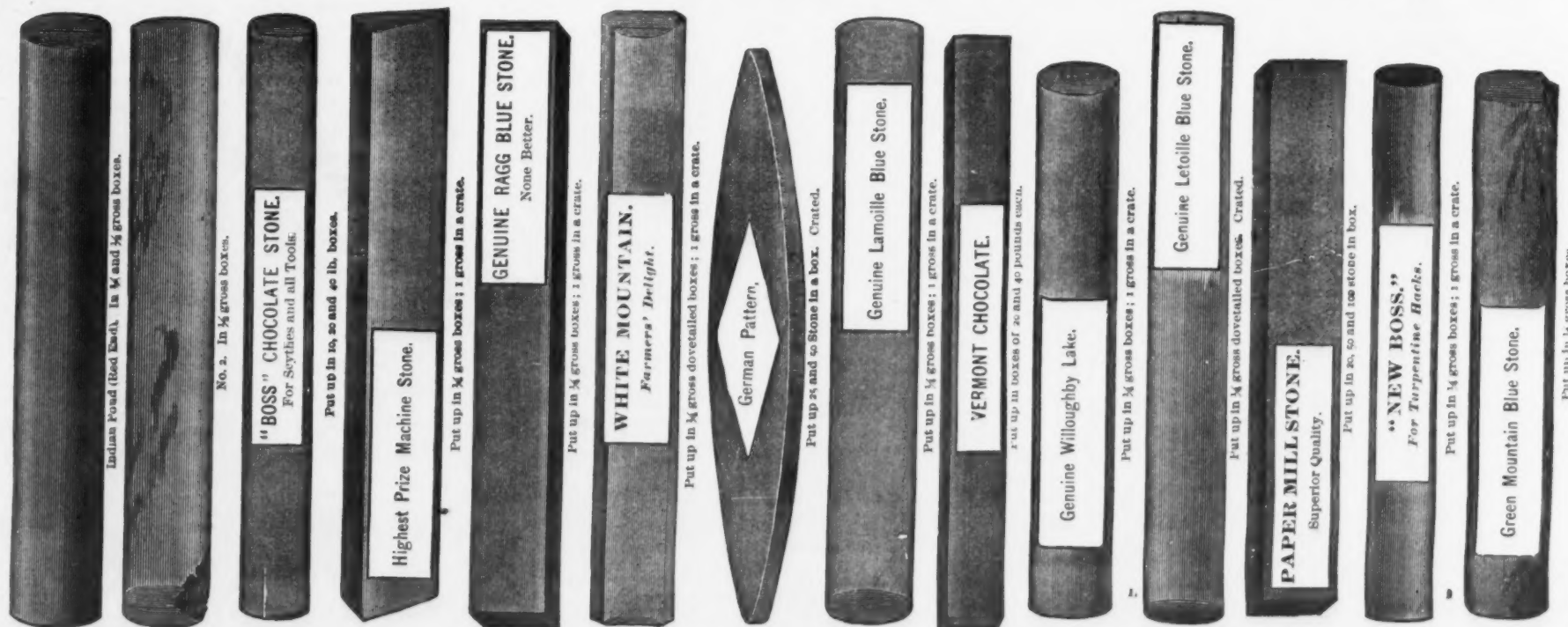


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The World's Headquarters for Pike's Celebrated Blue Stone for Scythes and all Edge Tools.

## LIST OF BRANDS.

Old,  
Reliable,  
Indian Pond,  
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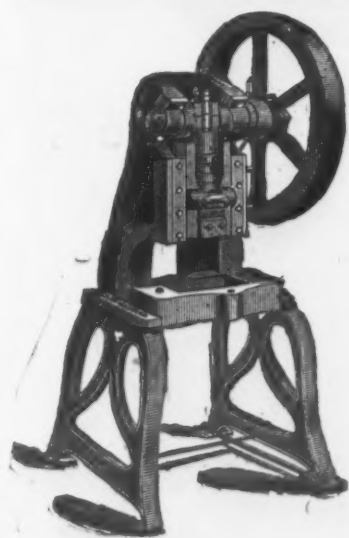
**G. A. CROSBY & CO.,**  
259 & 261 Randolph St.,  
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Manufacturers of all kinds of  
Power, Screw, Hand, Foot  
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And Special Tools for Tin Can Makers and  
Sheet Metal Workers.

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20,000 Sold the Second Year.  
THE BEST ADJUSTABLE BAG HOLDER  
In the World.



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KEYSTONE WORKS. Centennial Award  
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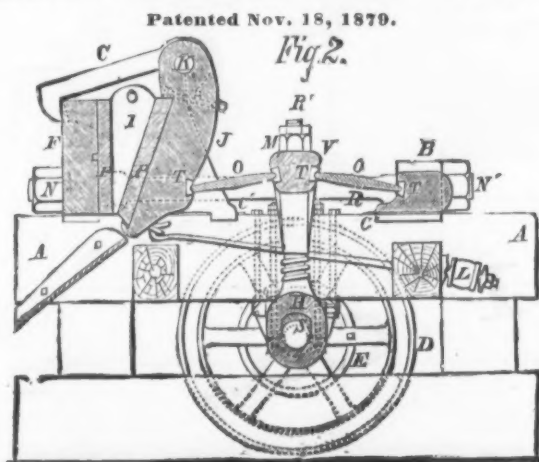
Shovels, Spades, Scoops,  
Coal Hods, &c.,

Nos. 511, 513 and 515 LOCUST ST.,  
PHILADELPHIA, PA., U. S. A.

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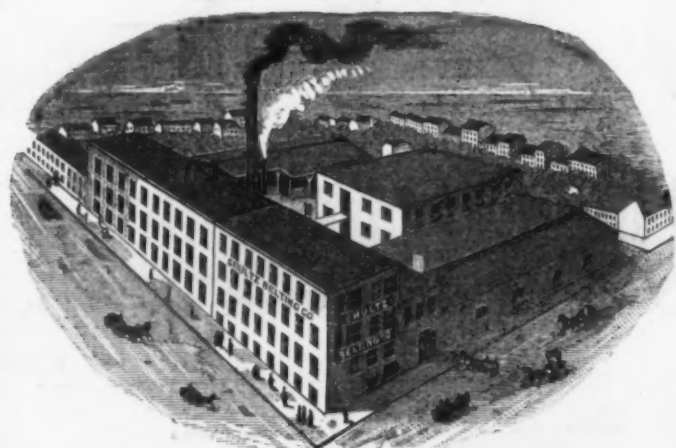
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The most economical and reliable Crusher in use. Superior in all respects to our old style Blake Crushers, and rapidly superseding them and all imitations. For railway ballast, Macadam road making, and crushing of ores of all kinds it has no competitor. This machine dispenses with cast iron frame and pitman of our old forms. All strains are on wrought iron or steel. Awarded medals of superiority by judges of American Institute Fair, New York City, 1879 and 1880, where it was exhibited in competition with our old forms of Crusher. Address,

**BLAKE CRUSHER CO.,**  
Sole Makers,  
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Office and Factory, Cor. EASTON & BARTON Sts.,  
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## SHULTZ BELTING COMP'Y, MANUFACTURERS OF Shultz Patent Fuled Leather Belting And Lace Leather.

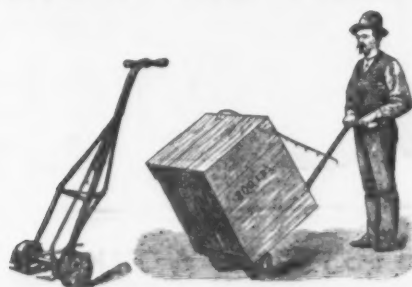
Our BELTING is made of Leather, tanned on the surfaces only; the interior (which is the Fibre and strength of the hide) is not tanned, but Rawhide fuled and softened by our patented process. Our Belting is more pliable, and hugs the pulley better, and transmits more power than any other belt. Our Rawhide Lace Leather, and Belt Grease, are the best in use.

### VALVES FOR FURNACES and IRON WORKS.

We make out of our Patent Leather, Valves for furnaces which we claim last five times as long as any other. We will furnish for trial \$5.00 worth, without charge, to each of the first ten parties sending us sizes. We also send a useful little book on Belting free, on application. Agents in all important cities.

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## ADAMS PATENT SELF-LOADING TRUCK.



We refer to the following parties who are using them:

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The right to manufacture and sell in several cities and States for sale.

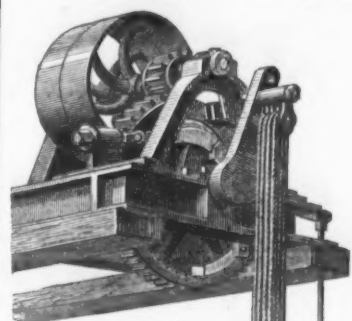


## THIS RAZOR STROP

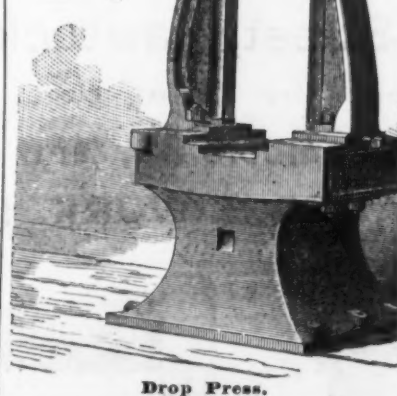
is made up throughout of only the very best selected material, such as the practical experience of years has satisfied the inventors alone can be used in its construction with a certainty of standing the test of time. We confidently recommend it to the trade as the best strop in the market.

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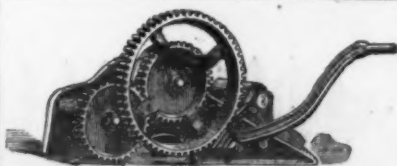
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**DROP HAMMERS,**  
HORIZONTAL PRESSES  
For Bending Iron, Gang Boring Machines, Tools for  
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Send for Circulars.



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**Quick Adjustable Tire Bender.**  
The best and cheapest arrangement for bending tires in the market. Simple in construction, adjustable to any size or diameter tire.  
No. 1 bends any tire up to 4 1/2 in. wide.....Price, \$10.00  
No. 2 bends any tire up to 6 in. wide.....Price, 12.00  
Correspondence with Jobbers solicited.



**IMPROVED AUTOMATIC TIRE AND AXLE UPSETTER.**  
The most perfect machine for upsetting or shrinking wagon tires, axles, braces, &c., ever placed in the market. Every blacksmith should have one. They are cheaper than any other machine, and one man operates it alone. Liberal discount to the trade and agents. Send for circulars and discount. Correspondence with Jobbers solicited.  
No. 1 upsets any tire up to 3 in. wide x 1/4".....Price, \$10  
No. 2 upsets any tire up to 4 in. wide x 1/4".....Price, 12  
For sale by RUSSELL & ERWIN MFG. CO., 45 Chambers St., New York, and E. C. THOMBLEY & CO., Pittsburgh, N. Y. (P. O. Box 310), Mfrs. and Proprietors.

The "Salem" Elevator Bucket.  
FIRST PREMIUM AT THE  
MILLERS' INTERNATIONAL EXHIBITION.

What Users Say of It:

We consider the "Salem" the "Best in the market." What better testimonial can you have than the size and frequency of our orders? THE LINE BELT MACHINERY COMPANY, Chicago.

We find the "Salem" to be first-class in every respect. R. D. HUBBARD & CO., Mankato, Minn.

We like the "Salem" Bucket. Ship us 55 more at once. STRAITSVILLE CENTRAL MINING CO., Columbus, O.

It is nearer Perfection in every respect than any other Bucket made.

SAMPLE MAILED FOR 15 cents (stamps.)

W. J. CLARK & CO., Sole Mfrs.,  
Salem, Ohio.

New York Office, 9 Cliff Street.  
Please name this paper.

### GRAY IRON CASTINGS.

JOHN KEPPELMAN, Reading, Pa.,  
Herewith gives notice that he has opened a Jobbing Foundry, and is ready to receive orders for all kinds of Light Gray Iron Castings; also, for every description of Machinery. Orders promptly filled. Please address JOHN KEPPELMAN, Cor. 2d and Court Sts., Reading, Pa.

**GRANVILLE  
HYDRAULIC ELEVATOR COMPANY,**  
Offices, No. 1193 Broadway,  
NEW YORK.

Hydraulic Elevators for Passengers or Freight. Hydraulic Double-Acting Dumb Waiters. Hydraulic Sidewalk Elevators. N. B.—Steam Elevators altered to Hydraulic Elevators.

## JARVIS PATENT FURNACE

For Setting Steam Boilers.



Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMENS PROCESS OF MAKING STEEL; utilize the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c. Send for circular.

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BESTON & NICKEL, New York Agents, No. 92 Liberty St.  
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**WILCOX & HOWE,**  
BIRMINGHAM, CONN.,  
Manufacturers of

## CARRIAGE IRON FORGINGS



The "Derby."

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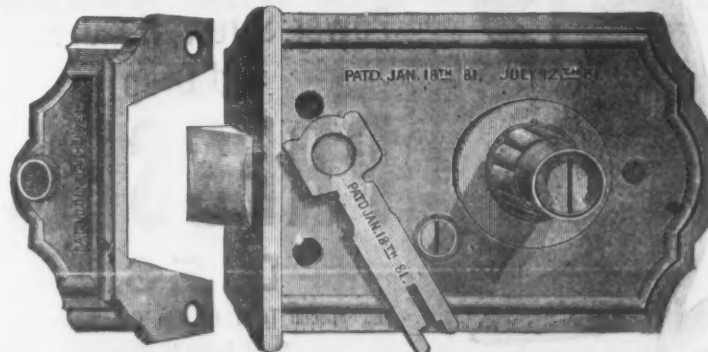
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FIFTH WHEELS, BODY LOOPS, STAY ENDS, OFFSETS, SLAT IRONS, REACH PLATES, JOINT ENDS, STEPS, &c.

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THE  
Recognized Standard of the World for Cleaning the  
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Upon many of which there is more Nickel than iron surface to clean. It is also sold  
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BEST AND QUICKEST CLEANER OF SILVERWARE EVER PRODUCED.  
PAYS 50 PER CENT. PROFIT.

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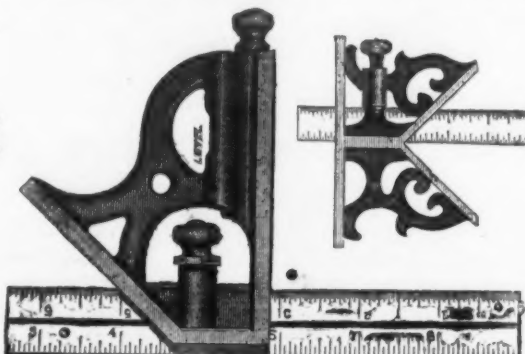
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SQUARE  
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Center Square and Draughtsman's T Square.  
A TOOL NEEDED BY EVERY WORKMAN.

Having an ADJUSTABLE BLADE OR TONGUE it supplies the place of an

ENTIRE SET OF COMMON TRY SQUARES

At a small fraction of their cost, and can be used for an almost endless variety of purposes. Send for Price List.

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EMERY, RUBY AND CORUNDUM WHEELS,  
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RAW HIDE LACE LEATHER AND BELTING.

Glue, Nickel Anodes, Crocus, Rouge, Composition.

IMPROVED AUTOMATIC KNIFE GRINDER.

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From Selected Stock, Thoroughly Seasoned, Well Made.

Orders solicited from close buyers who want good work.

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Manufacturers of

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**The Boss Lemon Squeezer.**

Malleable Iron and

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Acknowledged the Best.

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SABIN'S LEVER DOOR SPRINGS, For heavy doors.

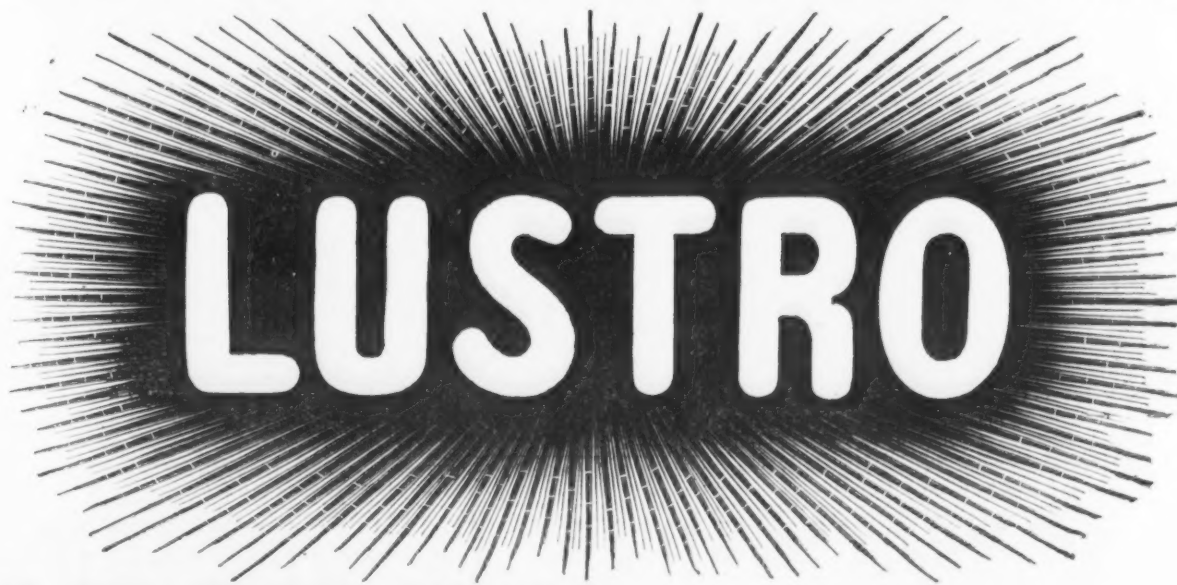
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**SELF-LOCKING SCREW CASE.**

Made from the Best Gray,  
Malleable and Sheet Iron.

This is not a Drawer Case. This Structure has been  
purposely invented on account of trouble caused by  
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The Standard of This Case is a Hollow Cone.  
Firm as a Rock, on Which all  
Shelves Revolve.

All Shelves can be taken off and replaced in a few  
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The ornamental front frames of each Circle, well  
protected, contain a piece of glass, whereby the dealer  
can see through all Compartments in a minute,  
and if any number is out, can fill, or if not in stock,  
can order, which in a Drawer Case makes a great  
deal of trouble. The front frames can be taken out  
and replaced by anyone in no time, thus making it  
the most perfect structure ever placed upon the  
market. With beauty and strength combined, it  
surpasses even perfection in the highest state.

You have no Drawers to take out or put back.  
No mixing of Screws by Customers helping them-  
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Shelves; or all worse, when standing on the  
counter. No losing of Customers while looking  
through Drawers of mixed Screws.

In our Case only one Compartment is open at the  
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Any number can be found instantaneously. By  
turning to the right, numbers increase, by turning  
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frames and gold-brushed. We guarantee our Case  
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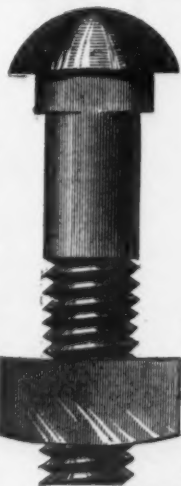
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We invite the attention of RAILROAD MEN especially, to our  
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Our works have been enlarged within a few years; all orders are  
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**Northrop's Patent Cap Seam Iron Roofing,**

In Sheets, Boxed or Rolls.

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Fire Proof and Highly Ornamental.

CRIMPED IRONS FOR ROOFING AND SIDING, OF VARIOUS STYLES.

Mill owners, or parties who make or buy their own iron, can have it crimped at the mill or where wanted  
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**MALLEABLE & GREY IRON CASTINGS**

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ALL MALLEABLES MADE FROM IMPROVED AIR FURNACES.

**Patented Articles of  
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Three Sizes. Nos. 1, 2 & 3.



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Hammer's Adjustable Clamps.

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pattern Heavy Screw Clamps.

strongest in the market.

For sale by all the principal Hardware Dealers.

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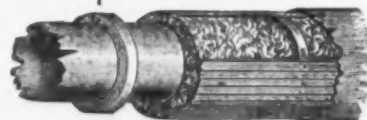
**Malleable Iron Castings**

of superior quality, and Hardware Specialties in  
Malleable Iron made to order.

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A fibrous material, encasing about 90 per  
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**HEAT AND SOUND.**

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Manufacturers of

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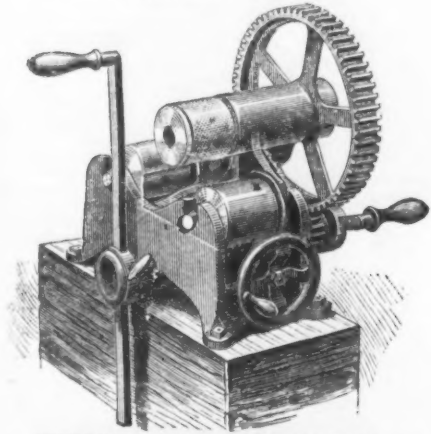


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TURKEY WING GRINDING CRADLES,  
4, 5 and 6 fingers.  
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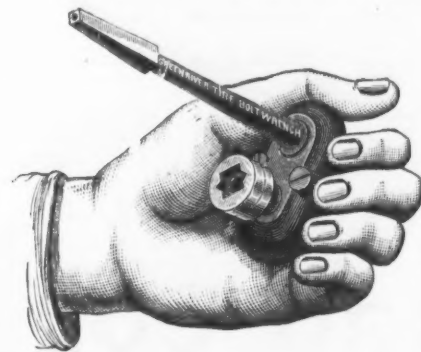


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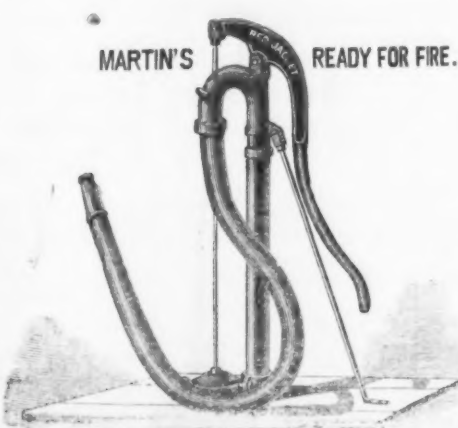
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GREEN RIVER PATENT RIM WRENCH  
For Nuts on Tire Bolts Inside the Felloe.



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ADJUSTABLE  
DOUBLE-ACTING  
Lift and Force  
PUMPS,**  
For General Pur-  
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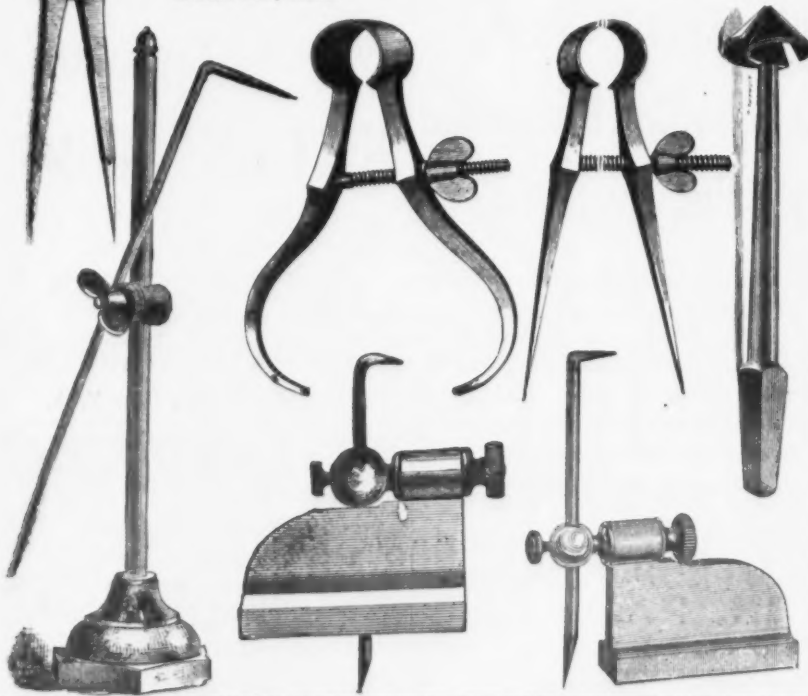
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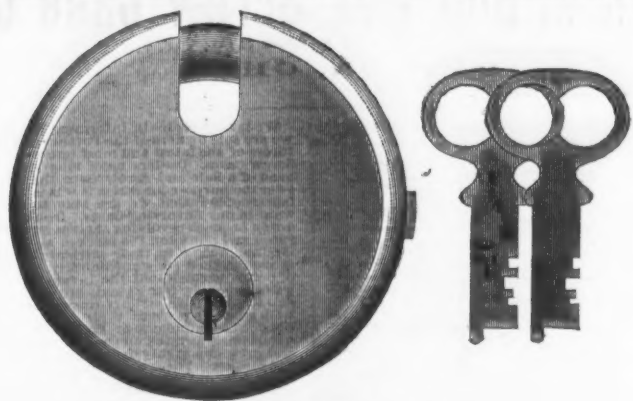
Spofford Bit Brace.

Spofford Sleeve Brace.

The Spofford Bit Brace is made under Letters Patent of the U. S. A., granted to N. Spofford, March 23, 1866,  
and to Fray & Pigg, and now held by John S. Fray, Mr. Pigg having retired from the firm.  
Sleeve Brace.  
No. 70..... 7 inch sweep.  
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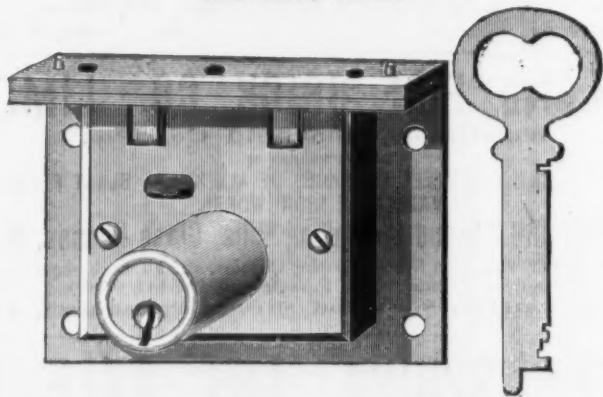
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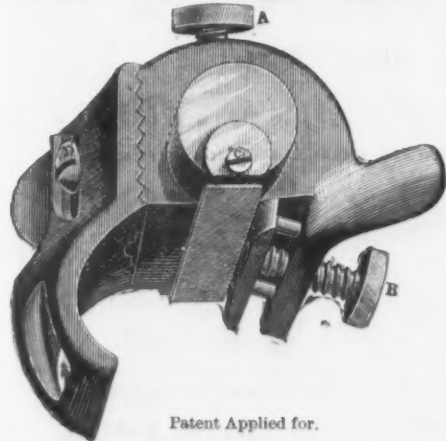
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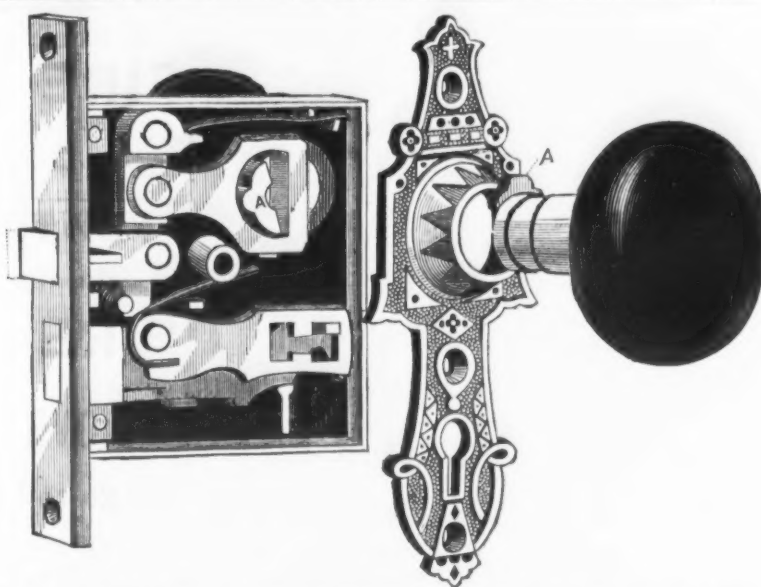
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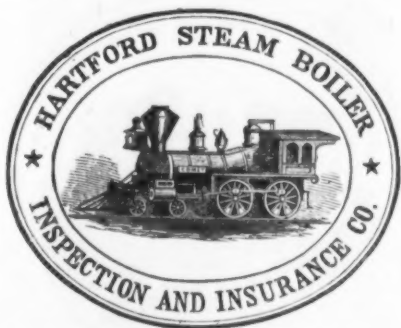
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the same time, and when once disturbed must  
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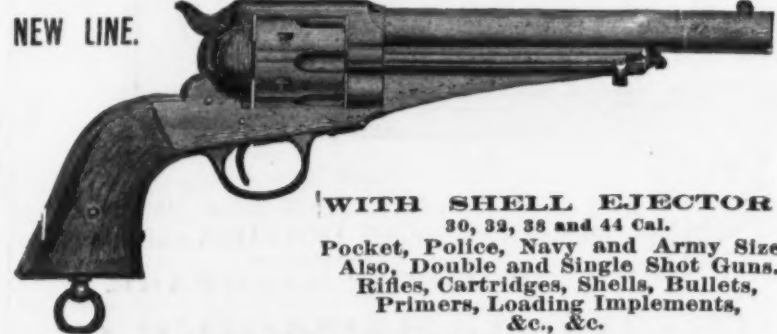
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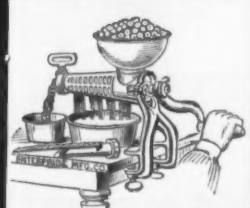

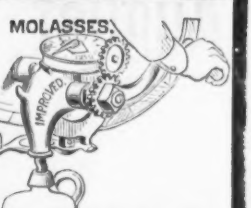
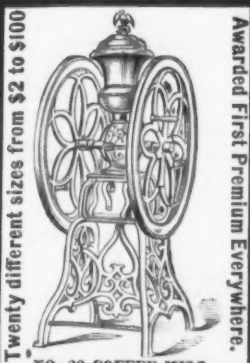

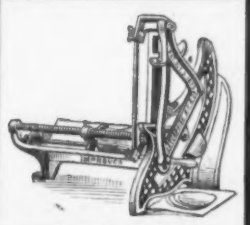
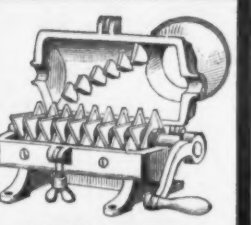



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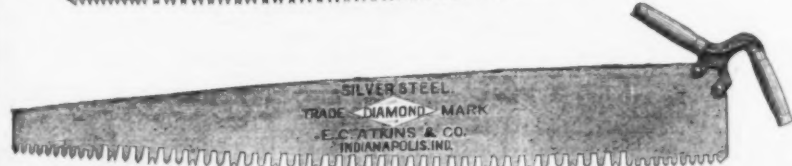
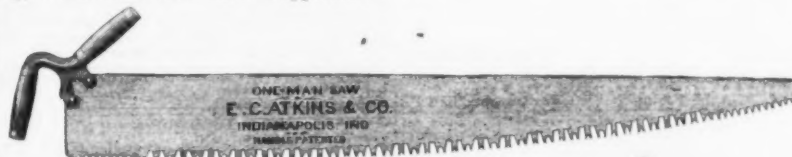
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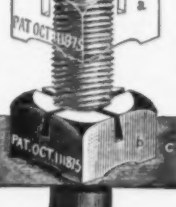
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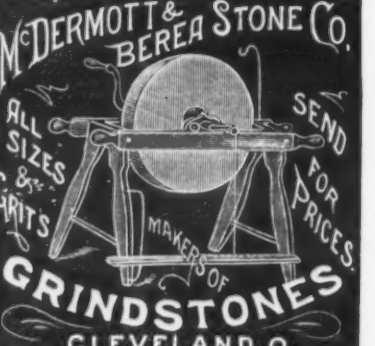
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In bulk, new list, Dec. 10, 1881.....dis 40 @ 45  
Copper Rivets and Burns.....dis 40 @ 45  
Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000

**Rivet Sets.**  
Star, Brass.....dis 25 @ 30  
Star, Black Walnut.....dis 25 @ 30  
Star, American Patent.....dis 25 @ 30

**Rollers.**  
Barn Door, Sargent's list.....dis 60 @ 100  
Acme (Anti-Friction).....dis 60 @ 100

**Rope.**  
Mills' List, July 6 and 17, 1882.....dis 10 @ 15  
Manilla.....dis 10 @ 15  
Manilla, 1/2 inch and larger.....dis 10 @ 15  
Manilla, 1/4 inch and larger.....dis 10 @ 15  
Manilla, 1/8 inch and larger.....dis 10 @ 15  
Manilla, 1/16 inch and larger.....dis 10 @ 15  
Manilla, 1/32 inch and larger.....dis 10 @ 15  
Manilla, 1/64 inch and larger.....dis 10 @ 15  
Manilla, 1/128 inch and larger.....dis 10 @ 15  
Manilla, 1/256 inch and larger.....dis 10 @ 15  
Manilla, 1/512 inch and larger.....dis 10 @ 15  
Manilla, 1/1024 inch and larger.....dis 10 @ 15  
Manilla, 1/2048 inch and larger.....dis 10 @ 15  
Manilla, 1/4096 inch and larger.....dis 10 @ 15  
Manilla, 1/8192 inch and larger.....dis 10 @ 15  
Manilla, 1/16384 inch and larger.....dis 10 @ 15  
Manilla, 1/32768 inch and larger.....dis 10 @ 15  
Manilla, 1/65536 inch and larger.....dis 10 @ 15  
Manilla, 1/131072 inch and larger.....dis 10 @ 15  
Manilla, 1/262144 inch and larger.....dis 10 @ 15  
Manilla, 1/524288 inch and larger.....dis 10 @ 15  
Manilla, 1/1048576 inch and larger.....dis 10 @ 15  
Manilla, 1/2097152 inch and larger.....dis 10 @ 15  
Manilla, 1/4194304 inch and larger.....dis 10 @ 15  
Manilla, 1/8388608 inch and larger.....dis 10 @ 15  
Manilla, 1/16777216 inch and larger.....dis 10 @ 15  
Manilla, 1/33554432 inch and larger.....dis 10 @ 15  
Manilla, 1/67108864 inch and larger.....dis 10 @ 15  
Manilla, 1/134217728 inch and larger.....dis 10 @ 15  
Manilla, 1/268435456 inch and larger.....dis 10 @ 15  
Manilla, 1/536870912 inch and larger.....dis 10 @ 15  
Manilla, 1/1073741824 inch and larger.....dis 10 @ 15  
Manilla, 1/2147483648 inch and larger.....dis 10 @ 15  
Manilla, 1/4294967296 inch and larger.....dis 10 @ 15  
Manilla, 1/8589934592 inch and larger.....dis 10 @ 15  
Manilla, 1/17179869184 inch and larger.....dis 10 @ 15  
Manilla, 1/34359738368 inch and larger.....dis 10 @ 15  
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Manilla, 1/549755813888 inch and larger.....dis 10 @ 15  
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Manilla, 1/70368744177664 inch and larger.....dis 10 @ 15  
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Manilla, 1/4503599627370496 inch and larger.....dis 10 @ 15  
Manilla, 1/9007199254740992 inch and larger.....dis 10 @ 15  
Manilla, 1/18014398509481984 inch and larger.....dis 10 @ 15  
Manilla, 1/36028797018963968 inch and larger.....dis 10 @ 15  
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Manilla, 1/144115188075855872 inch and larger.....dis 10 @ 15  
Manilla, 1/288230376151711744 inch and larger.....dis 10 @ 15  
Manilla, 1/576460752303423488 inch and larger.....dis 10 @ 15  
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Manilla, 1/18446744073709551616 inch and larger.....dis 10 @ 15  
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Manilla, 1/73786976294838206464 inch and larger.....dis 10 @ 15  
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Manilla, 1/590295810358705651712 inch and larger.....dis 10 @ 15  
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Manilla, 1/3568119231764899702646062080073235821075456 inch and larger.....dis 10 @ 15  
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Manilla, 1/14272476927059598810584248320292943284301824 inch and larger.....dis 10 @ 15  
Manilla, 1/28544953854119197621168496400585886568603648 inch and larger.....dis 10 @ 15  
Manilla, 1/57089907708238395242336992801171773137207296 inch and larger.....dis 10 @ 15  
Manilla, 1/114179815416476790484673985602343542674414592 inch and larger.....dis 10 @ 15  
Manilla, 1/228359630832953580969347971204687085348829184 inch and larger.....dis 10 @ 15  
Manilla, 1/456719261665907161938695942409374170697658368 inch and larger.....dis 10 @ 15  
Manilla, 1/913438523331814323877391884818748341395316736 inch and larger.....dis 10 @ 15  
Manilla



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A Large Assorted Stock of JOHN ROTHERY'S FILES always on hand.

Warranted Superior to any Steel in the Market, either

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Also,

Combination Chrome Steel and Iron for

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# Steel Rails,

ALL WEIGHTS.

The Company warrant its Rails equal in quality to any manufactured in the

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**Special Steel**

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Turns out at least double work by increased speed  
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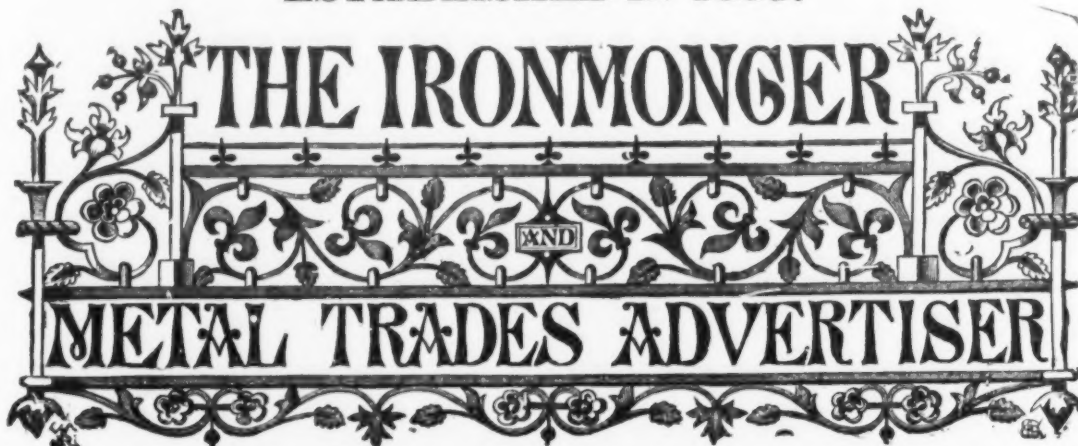
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KEYSTONE SAW, TOOL, STEEL & FILE WORKS,

Front and Laurel Streets,

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## DISSTON'S SAMSON TREE PLANTER AND POST HOLE DIGGER.



Fig. 1.

Patented May 29, 1876.

Price, - - - \$37.50 per dozen.

No Farmer, Nurseryman, Railroad  
or Telegraph Company  
SHOULD BE WITHOUT ONE.

NO BACK-ACHE.

NO KNEE-WORK.

NO CLOGGING.

This tool has been thoroughly tested, and has given the greatest satisfaction to all who have tried it. The principle on which it works makes it self-cleaning and prevents adhesion in sticky soil; therefore it always works free and easy. It is far superior to all plungers, augers and boring machines, as it works well in stony, sandy, or clay soils; quicksand under water is as easily removed as though no water existed.

### DIRECTIONS.

Plunge the Digger into the ground, as shown in cut, Fig. 1, and when the soil is loosened pull out the lever with one hand, as shown in cut, Fig. 2, which will press the dirt between the blades; then draw the Digger from the hole, keeping hold of the lever with one hand and the handle with the other. When the Digger is clear of the hole, you can deposit the load anywhere within reach by simply pressing down the lever, which will open the blades and the dirt will fall from between them. The Digger is then ready for another plunge. The steel blades are nine inches long, and the whole tool five feet long. For sale at Hardware and Agricultural Stores.



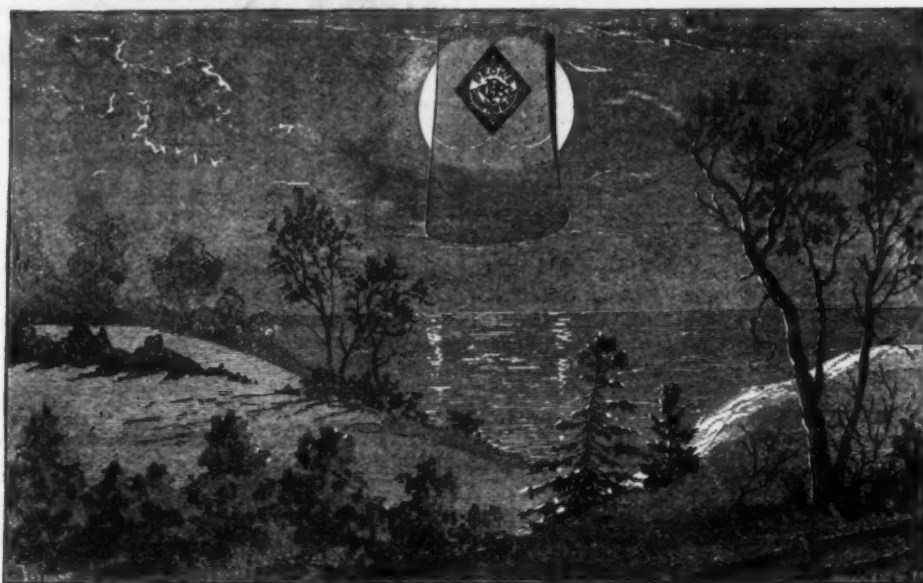
Fig. 2.

HENRY DISSTON & SONS.

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Agents for A. G. PECK & CO., Cohoes, N. Y.



TOTAL ECLIPSE. 1882.

Peck's "CHAMPION BLADE." Eclipses All Other Axes.



Cuyahoga Falls,  
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Tinned  
Belt Rivets  
AND  
Burrs a Specialty.

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NEW BEDFORD, MASS., Sole Manufacturers of

Morse Patent Straight-Lip Increase Twist Drill,  
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DRILLS FOR COES, WORCESTER, HUNTER AND OTHER HAND DRILL  
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AND ADJUSTABLE DRILL CHUCKS, SOLID AND SHELL REAMERS.  
DRILL GRINDING MACHINES. TAPER REAMERS, MILLING  
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All Tools exact to Whitworth Standard Gauges.

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A full stock of all Patterns. London, N. Y.,  
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Every Trowel warranted.

HAMMOND'S  
Window Springs

Lock and support upper and lower  
sashes—all sizes. Are very conven-  
ient, simple and durable. Sample  
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W. S. HAMMOND,  
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Circulars give full instructions.

Print Your Own Cards, Labels,  
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Send two stamps for Catalogue of  
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WIRE  
RODS. Spring  
quality, of Besse-  
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Has Self-Adjustable Foot Rest.

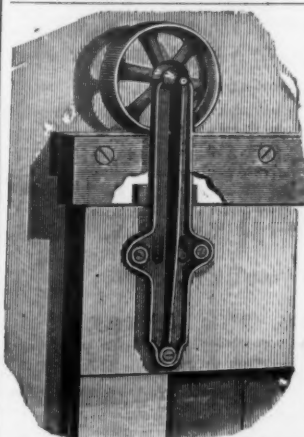
NEW AUTOMATIC COMPENSATING  
PACKING.

It will throw a continuous jet FROM  
FORTY TO SIXTY FEET. A new pattern  
jet and spray nozzle is sent with  
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Especially attention is called to the  
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in these pumps.

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THE NEW ENGLAND BUTT CO  
PROVIDENCE, R. I.



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Patented April 13, 1866; Relapsed Jan. 11, 1881.

This patent covers all rail with a recess in the under  
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We also manufacture

THE RIDER WOOSTER, and CHAMPION  
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Manufacturer of every description

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Cork Lined, first quality,  
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Lignumvitae Key, Rosewood,  
Red Cedar, Cherry and But-  
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John Sommer's Metallic Key  
and First Quality Cork-lined  
Faucets are the best.  
Send for catalogue.

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Mills of the United States have recom-

White Mountain Freezer to all per-  
sons in the world for the following rea-  
sons: We have used them; they freeze  
quicker than any other; they save time,  
salt and ice; the triple motion makes  
smooth cream without lumps; makes  
more of it; galvanized iron outside; tin  
inside; no zinc in contact with the  
cream; easily adjusted; substantially  
made; simple in construction; per-  
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Address,

HAND FREEZER. 21 G 24 G 28 G. \$15.00 to \$25.00.  
HAND OR POWER. 34 and 42 G. \$75.00 and \$175.00.  
HAND OR POWER. ICE CRUSHER. \$75.00.  
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SPECIAL ATTENTION GIVEN TO EXPORT ORDERS.

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Can be attached to any drop now in use.

Send for Illustrated Catalogue.

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EXCELSIOR POLISH, PUMICE, METAL QUARTZ, AND ROTTEN STONE. CROCIUS, ROUGE, GLUE SAND PAPER, EMERY PAPER, AND CLOTH. EMERY WHEELS, &c. &c.  
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Steel Toe Calk.  
FINISHED READY FOR NAILING ON.  
WARRANTED

The Best and Cheapest Shoe Made.

IVES, WOODRUFF & CO.  
Manufacturers,  
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For sale by dealers in blacksmiths' supplies.

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FINE GRAY IRON CASTINGS OF EVERY DESCRIPTION.  
Rosettes and Pickets for Wire Workers, Castings for Furniture and Piano  
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Corrected Weekly by Lloyd, Supple &amp; Walton.

Terms, 30 days. For 10 or 20 days, interest added at 10% per cent. per annum.

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Peter Wright &amp; Co. 10% 10% 10%

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## Apple Parers.

Globe Apple Parer. \$5.00 net

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Lots of 10 to 25 dozen special prices.

Bay State Peach Parer. \$5.00

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Hunt's Kentucky and Yankee. per doz \$10.00

Robert Mann. \$8.00 @ \$2.25

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Broad. \$10.00 @ \$3.00

Cast Loose Joint, Narrow. \$10.00 @ \$3.00

Broad. \$10.00 @ \$3.00

Aorn. Loose Pin. \$10.00 @ \$3.00

Mayer's Loose Joint. \$10.00 @ \$3.00

Wrought Loose Pin. \$10.00 @ \$3.00

Table Hinges and Back Flaps. \$10.00 @ \$3.00

Narrow, Fast. \$10.00 @ \$3.00

Loose Joint. \$10.00 @ \$3.00

## Blind Butts.

Parker. \$10.00 @ \$3.00

Clark. \$10.00 @ \$3.00

Shepard. \$10.00 @ \$3.00

Lull &amp; Porter. \$10.00 @ \$3.00

Hutter. \$10.00 @ \$3.00

## Chains. German Halter and Coll. list December 31, 1881.

Galvanized Pump. \$10.00 @ \$3.00

Best Proof Coil Chain. \$10.00 @ \$3.00

13 10 8 6 4 2 1 1/2 1 3/4 2 1/2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Chisels. Socket Framing. \$10.00 @ \$3.00

Socket Framing. \$10.00 @ \$3.00

Butcher's. \$10.00 @ \$3.00

Cansters. Bed (new list July 1, 1882). \$10.00 @ \$3.00

Plate. \$10.00 @ \$3.00

Coffee Mills. Box and Side, new list Jan. 1, 1882.

Enterprise. \$10.00 @ \$3.00

Cutlery. Walden Pocket. new list

Penna. Knife Co. new list

Landers, Frary &amp; Clark. \$10.00 @ \$3.00

Goodnow Mfg. Co. and Meriden Cutlery Co. Manufacturers' prices net.

## Drawing Knives.

Hart Mfg. Co. \$10.00 @ \$3.00

Adjustable Handle. \$10.00 @ \$3.00

## Fry Pans.

Tinned. \$10.00 @ \$3.00

\$10.00 @ \$3.00

Burnished. \$10.00 @ \$3.00

\$10.00 @ \$3.00

Fires. \$10.00 @ \$3.00

Nicholson. \$10.00 @ \$3.00

Diston. \$10.00 @ \$3.00

Butcher. \$10.00 @ \$3.00

Filing Machines. \$10.00 @ \$3.00

Single. \$10.00 @ \$3.00

Crown. \$10.00 @ \$3.00

2 in. roll. \$10.00 @ \$3.00

1 in. roll. \$10.00 @ \$3.00

Geneva Fluter. \$10.00 @ \$3.00

Favorite com. Fluter &amp; Sad Iron. \$10.00 @ \$3.00

Hammer. \$10.00 @ \$3.00

Verkes &amp; Plumb's, new list. \$10.00 @ \$3.00

Mayfield Hammer. \$10.00 @ \$3.00

Howell A. E. No. 1. \$10.00 @ \$3.00

Handles. \$10.00 @ \$3.00

Diston Loop Handles Crosscut. \$10.00 @ \$3.00

Boynton Loop Handles Crosscut. \$10.00 @ \$3.00

Hatchets. Verkes &amp; Plumb, new list. \$10.00 @ \$3.00

Hunt. \$10.00 @ \$3.00

Blings. \$10.00 @ \$3.00

Strap T. \$10.00 @ \$3.00

Horse Nail. \$10.00 @ \$3.00

Ausable. \$10.00 @ \$3.00

Blued and Pointed. \$10.00 @ \$3.00

Globe. \$10.00 @ \$3.00

Clinton. \$10.00 @ \$3.00

Blacksmith Favorite, all sizes. \$10.00 @ \$3.00

Discount on Ausable, all sizes. \$10.00 @ \$3.00

Globe. \$10.00 @ \$3.00

Hay and Straw Knives. \$10.00 @ \$3.00

Lightning. \$10.00 @ \$3.00

Electric. \$10.00 @ \$3.00

Wadsworth. \$10.00 @ \$3.00

Walton Straw Knives. \$10.00 @ \$3.00

Locks and Keys. \$10.00 @ \$3.00

Brantford. \$10.00 @ \$3.00

Gardner Cabinet. \$10.00 @ \$3.00

American Padlocks. \$10.00 @ \$3.00

Scandinavian Padlocks. \$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

\$10.00 @ \$3.00

Screws.		
Flat Head Iron.	dis 30	
Brass.	dis 30	
Round Head Brass.	dis 25	
Iron.	dis 25	
Spoons.		
Plated.	dis 40	
German Silver.	dis 30	
Britannia, Boardman's.	dis 30	
Farker's.	dis 30	
Tinned.	dis 10	
Hinges. Torrey.	dis 40	
Gem No. 3 small Jap'd.	dis 40	
No. 2 medium Jap'd.	dis 40	
Coll No. 10, per gross net.	\$10.00	
Warner Door Springs, per doz. net.	1.75	
Standard Spring Hinges.		
Single No. 2, per doz. net.	1.50	
No. 1.	1.00	
Stocks and Dies.		
Stove Polish. Gem.	dis 30	
Dixon.	dis 30	
Fire Fly.	dis 30	
Tacks.	dis 40	
Shoe Nail. 4, 4 1/2, 5, 5 1/2, 6, 7, 8.	dis 30	
Double Pointed Tacks.	dis 30	
Traps.		
Genuine Onella. Newhouse.	dis 30	
m. Onella. Newhouse.	dis 30	
Vienna. Solid Box. Trenton new list.	dis 30	
Wrenches. Agricultural.	dis 40	
Coke. Genuine.	dis 40	
Mechanics.	dis 40	
Mail Bar.	dis 30	
Wire.		
Bright or Ann'd. No. 6 to 18.	dis 30	
No. 19 to 25.	dis 30	
No. 27 to 35.	dis 30	
Coppered, 6 to 18.	dis 30	
Tinned Broom Wire.	dis 30	
Galvanized Barb Wire.	dis 30	
Painted Barb Wire.	dis 30	
Galvanized No. 7 to 18. Market List.	dis 30	
Peerless No. 2 1/2.	dis 30	
Universal No. 2 1/2.	dis 30	
Novelty, No. 10.	dis 30	

## PITTSBURGH.

## Merchant Iron.

TERMS. Note of acceptance at 60 days, with current rate of exchange on New York, or a discount of 2 per cent. for cash, if remitted within 10 days from date of invoice.

For fluctuations and discounts on card rates see weekly Pittsburgh Trade Report.

The following are card rates.

## Flat Bar.

1 1/2 by 1/2 by 1/2 inch. \$2.50

1 1/2 by 1/2 by 1/2 inch. \$2.50

1 1/2 by 1/2 by 1/2 inch. \$2.50

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# PATENT RUBBER BUCKETS AND CHAIN FOR CHAIN PUMPS.



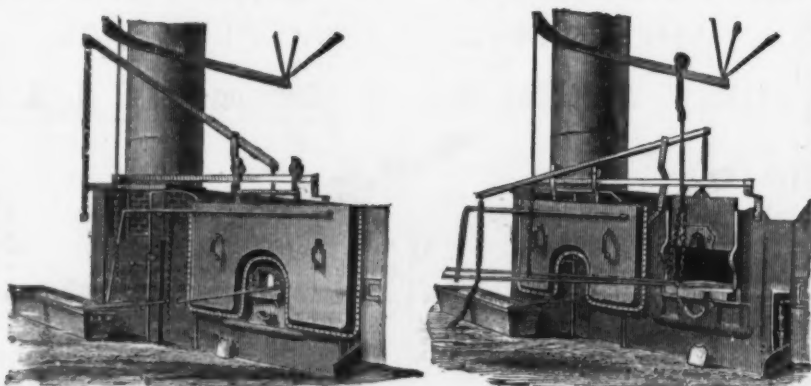
The only Perfect Expanding, Self-Draining Valve Bucket made. Our Patents cover the use of the Rubber, Nut and Bolt for Expanding, Tube and Valve for Draining. Order only the Rumsey Bucket, and avoid infringing.

SEND FOR SAMPLE.

L. M. RUMSEY MFG. CO., ST. LOUIS, MO.

**AMERICAN BOLT CO., Lowell, Mass.,**  
MANUFACTURERS OF  
**Bolts, Nuts, Washers, Chain Links, Car Bolts, Bridge Bolts, Lag Screws, &c.**

## McDONALD'S PATENT SHIELD.



For Protecting the Men from Heat when Working in Front of Puddling, Heating and other Furnaces.

**H. McDONALD, Patentee,**  
MANAGER SLIGO ROLLING MILLS,  
PITTSBURGH, PA.

Armstrong's Improved Adjustable Stock and Dies  
FOR PIPE AND BOLTS.



Tapped to the U. S. and Whitworth Standard Gauges. Adjustable to all variations in the size of fittings. Can be resharpened without drawing the temper by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circular and Price List sent free on application.

Manufactured by F. ARMSTRONG, 30 Sterling St., Bridgeport, Conn.

**LONG HANGING EAVE CUTTER.**  
FIFTY-SIX INCHES WITHOUT A SEAM.



It is made from best quality L. C. Lead Charcoal Plates formed in half circle and beaded on the side with 5/8 inch round bend, closed down to body of trough, so that it can be soldered as strength may require. Our different sizes measure full across diameter, and we pack in uniform crates or boxes of 25 feet each, ready to be put together in any desired length. We make three sizes, suitable for any building, and can ship promptly on receipt of order. Address,

Lock Box 1427. **ECKEL & CO., Richmond, Ind.**

LYON, CONKLIN & CO., Baltimore, Md., Eastern and Southern Agents.  
GIBSON, BAKER & CO., Cincinnati, Ohio.

**NIAGARA STAMPING & TOOL CO.,**  
Manufacturers of

**Presses, Dies and Tools**  
For Working Sheet Metal.

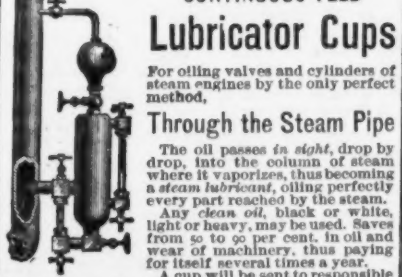
**Fruit Can and Tanners Tools, &c.**  
Works, 147 and 149 Elm Street,  
Near Clinton st., **BUFFALO, N. Y.**

**IMPROVED SHEET IRON ROOFING.**  
Best quality and simplest plan in use  
MANUFACTURED BY  
**T. C. SNYDER & CO., Canton, Ohio.**

Cheaper, stronger, and less liable to get out of repair than tin. Any mechanic can apply it. Sample Circular and Price List free by mail at request.

Also, Agents for LOWE'S METALLIC PAINT. Best and Cheapest in the World.

## THE DETROIT LUBRICATOR MFG. CO.'S CONTINUOUS FEED Lubricator Cups



For oiling valves and cylinders of steam engines by the only perfect method.  
The oil passes in sight, drop by drop, into the column of steam where it vaporizes, thus becoming a steam lubricant, oiling perfectly every part reached by the steam. Any clean oil, black or white, light or heavy, may be used. Saves from 50 to 90 per cent. in oil and wear of machinery, thus paying for itself several times a year.  
A cup will be sent to responsible parties on twenty days' trial, if desired. In ordering give diameter of cylinder.  
NOTICE.—The first Lubricators ever made, showing the oil passing drop by drop through a transparent water chamber, were devised by us, and the same are fully embraced by many Letters Patent owned and controlled by us. Lubricators of every nature embodying the above feature, made by other parties, are encroachments upon our rights, and we will hold purchasers and users, as well as manufacturers, responsible in damages for such violations.

Address  
**DETROIT LUBRICATOR MFG. CO.,**  
Office, 98 Griswold St., Detroit, Mich.

First Prize at Fair American Institute and Millers' International Exposition, Cincinnati, 1880.  
NOTE.—In our recent suit against the American Lubricator Co., of Detroit, before Justice Stanley J. Reed, of the U. S. Supreme Court, involving their eight-feed feature, a decree was rendered in our favor August 20, 1891.

**GUN POWDER.**  
**Laflin & Rand Powder Co.,**  
No. 29 Murray Street, New York.

Manufacture and sell the following celebrated brand of Sporting Powder known everywhere as  
**ORANGE LIGHTNING,  
ORANGE DUCKING,  
ORANGE RIFLE**

more popular than any Powder now in use.  
**Blasting Powder and Electrical Blasting Apparatus.**

Military Powder on hand and made to order.  
**SAFETY FUSE, FRICTIONAL & PLATINUM FUSES.**

Pamphlets showing sizes of grain sent free.

## THE DUPLEX INJECTOR.



The Best Boiler Feeder Known.  
Unequaled for simplicity and always reliable. Does not require adjustment for varying pressure of steam.  
Will start when the injector is hot.  
Less liable to get out of order than a pump.  
Always delivers water hot to the boiler.

Manufactured and for Sale by  
**JAMES JENKS,**  
16 & 18 Atwater St., East,  
DETROIT, MICH.

**DRILL PRESSES.**  
New Upright Power Drill Presses, No. 3; wing 21 inches, back geared, quick return motion; large steel spindle, balanced in column; revolving Arm and Table; cut Gears; Pulleys, 10 x 2 1/2; a strong brace extends from base to column, stiffening it at point of greatest strain—a new feature. Weight, 1100 lbs.; height, 6 feet. Price, \$120. Small size, wing 13 in., lever feed, three speeds; tight and loose pulleys (no countershaft required). Price, \$35.  
Peerless Punch & Shear Co.,  
38 W. Dey Street, New York.

**WM. ESTERBROOK,**  
Wholesale Manufacturer of  
**Coal Hods,**  
311 Cherry St., PHILADELPHIA.

**COAL HODS.**  
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**COAL HODS.**  
No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

**COAL HODS.**  
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**COAL HODS.**  
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**COAL HODS.**  
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**COAL HODS.**  
No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

**COAL HODS.**  
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## J. F. WOLLENSAK'S PATENT Transom Lifter and Lock.



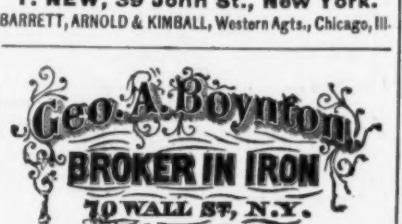
For all kinds of Transoms, Fanlights and Skylights.  
Send for catalogue and price list.

**J. F. WOLLENSAK,**  
Patentee and Sole Manufacturer,  
**CHICAGO, ILL.**

## T. NEW'S PREPARED ROOFING

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free.

**T. NEW, 39 John St., New York.**  
BARRETT, ARNOLD & KIMBALL, Western Agents, Chicago, Ill.



**BOSTON.**  
Reported by Macomber, Bigelow & Dimes.

Anvils.—"Eagle American"..... \$ 95c dia 20 1/2  
No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

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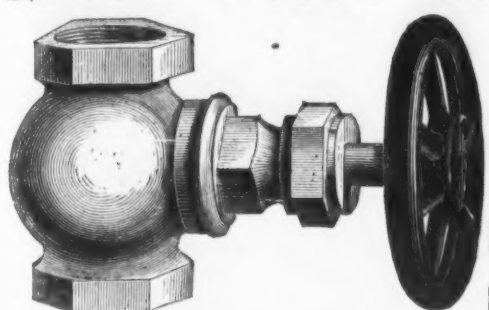
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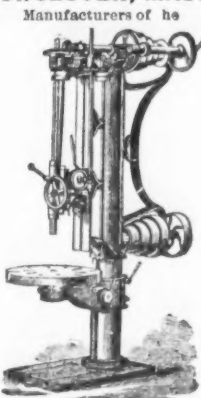
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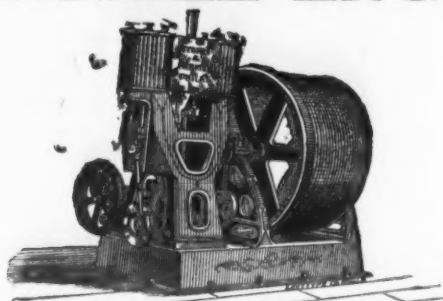


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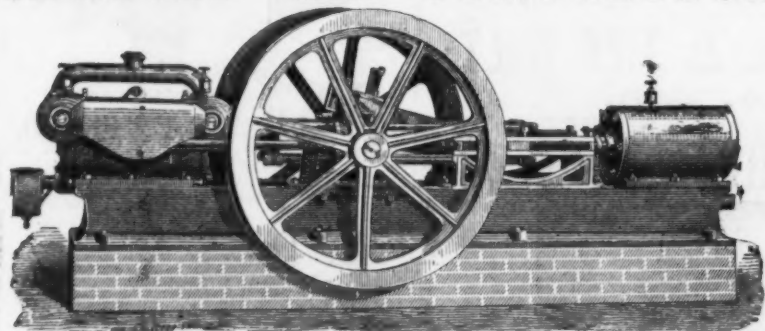
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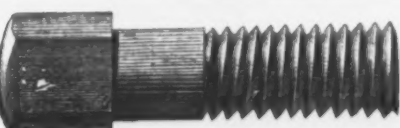
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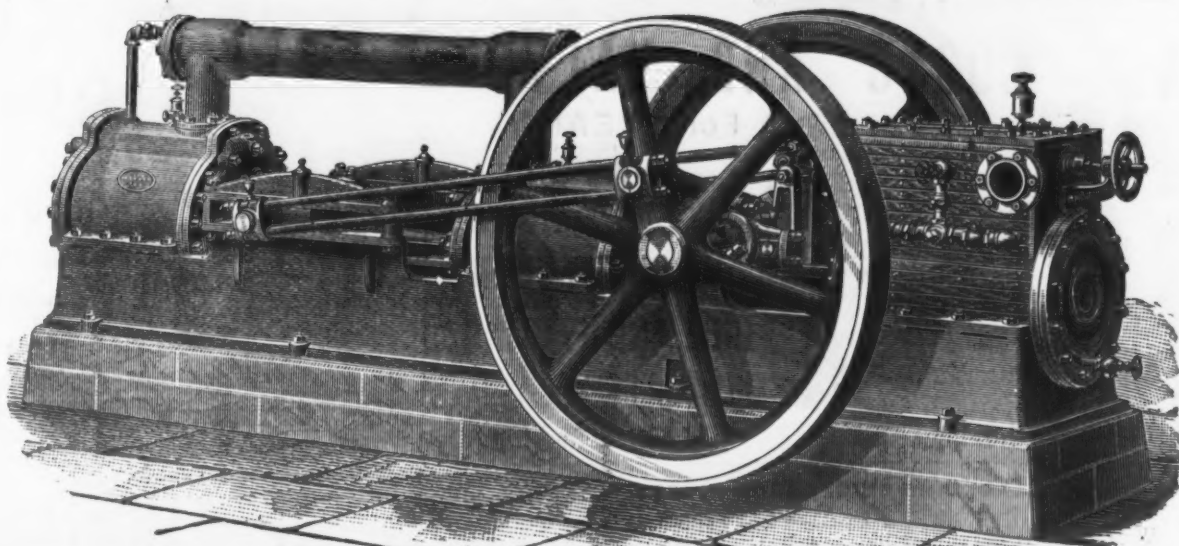
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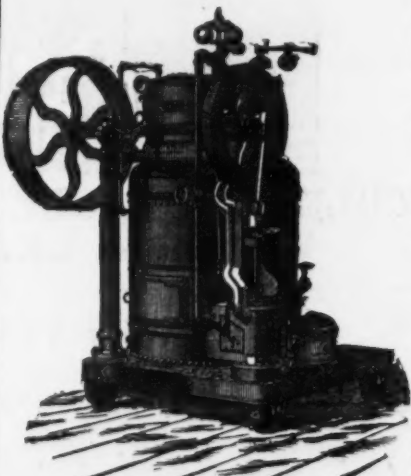
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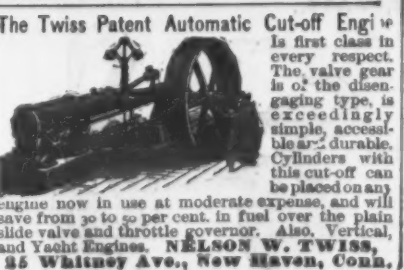
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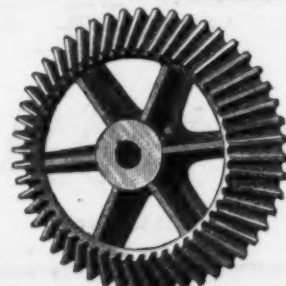
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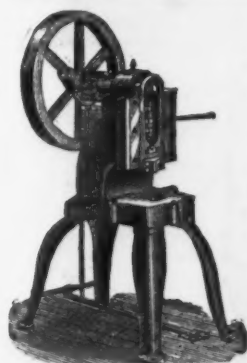
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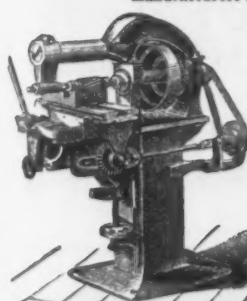
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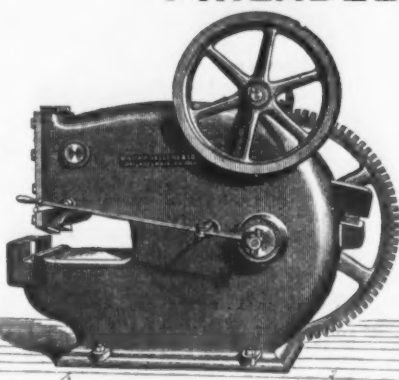
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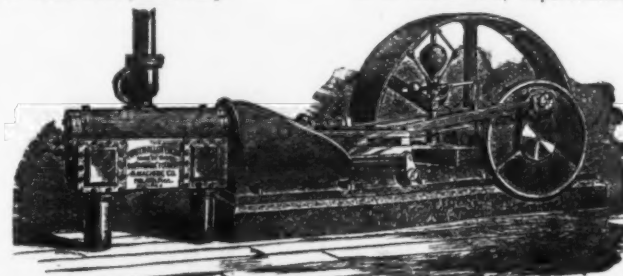


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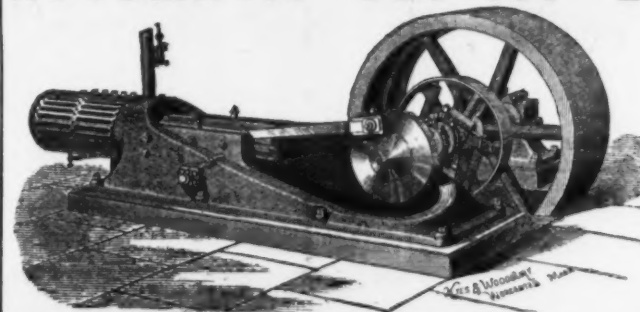


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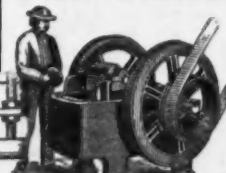


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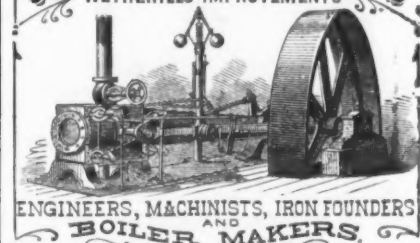
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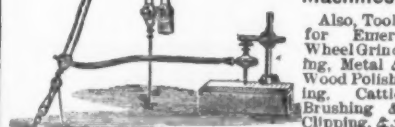
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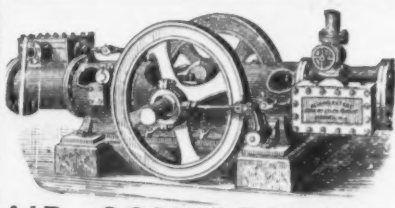
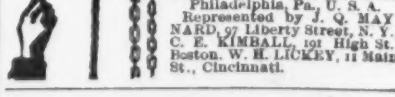
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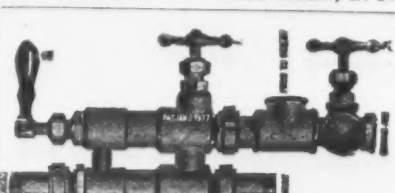


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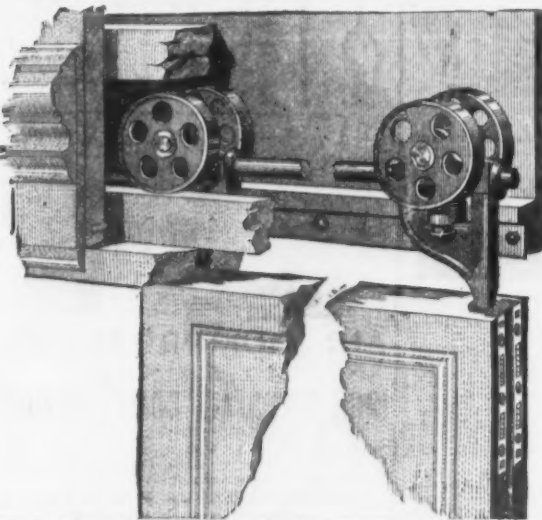
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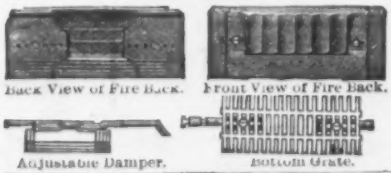
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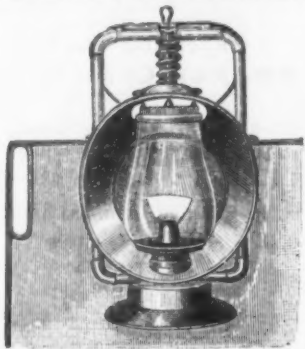
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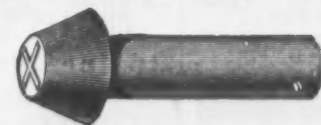
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